Fisheries and Oceans Canada | Pêches et Océans Canada
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Canadian Science Advisory Secretariat
Maritimes Region **Science Response 2025/017**

MARITIMES SUMMER ECOSYSTEM RESEARCH VESSEL SURVEY TRENDS ON THE SCOTIAN SHELF AND BAY OF FUNDY FOR 2024

CONTEXT

Fisheries and Oceans Canada (DFO) has conducted the Maritimes Summer Ecosystem Research Vessel Survey (herein, Summer Ecosystem RV Survey) in Northwest Atlantic Fisheries Organization (NAFO) Divisions 4VWX and DFO statistical unit area 5Yb using a standardized protocol since 1970. Results of these surveys provide information on trends in abundance for most groundfish species in the Maritimes Region. While these data reflect trends in biomass and abundance and are a critical part of science-based stock assessments, a full assessment, including other sources of data, would be required to evaluate the impacts of management measures on population status. DFO Resource Management requested a review of the Summer Ecosystem RV Survey information on the following list of fish stocks: 4Vn, 4VsW, and 4X5Y Atlantic Cod; 4VW and 4X5Y Haddock; 4X and 4VW White Hake; 4VWX Silver Hake; Western and Eastern Component Pollock; 4VWefghj and Unit III redfish; 4VWX Atlantic Halibut; 4VW and 4X American Plaice; 4VW and 4X Witch Flounder; 4VW and 4X Winter Flounder; 4VW and 4X Yellowtail Founder; 4VW and 4X Smooth Skate; 4VW and 4X Thorny Skate; 4VW and 4X Barndoor Skate; 4VW and 4X Winter Skate; 4VW and 4X Little Skate; 4VW and 4X Atlantic Wolffish; 4VW and 4X Monkfish; 4VW and 4X Longhorn Sculpin; 4VWX Spiny Dogfish; 4X and 4VW Red Hake; 4X and 4VW Sea Raven; 4X and 4VW Ocean Pout; 4VWX Blackbelly Rosefish; 4VWX John Dory; and 4VWX Shortfin Squid. In addition, biomass trends were requested for 4X and 4VW White Hake for lengths above 41 cm relative to the Scotia Fundy Groundfish Advisory Committee (SFGAC) accepted biomass reference points. The survey information will be used by DFO Resource Management as background for discussions with various stakeholders on recommendations for management measures and to determine which stocks should be reviewed in more detail in 2025.

In addition, available survey information was reviewed for Black Sea Bass, Dusky Shark, Triggerfish, and Tilefish. These species are being captured as bycatch in commercial fishing operations but are not covered under any license conditions and cannot be landed.

This Science Response Report results from the regional peer review of December 10, 2024, on the Update of Trends from the Maritimes Ecosystem Research Vessel Survey - Scotian Shelf and Bay of Fundy.

BACKGROUND

The Summer Ecosystem RV Survey of the Scotian Shelf and Bay of Fundy has been conducted annually since 1970. The survey follows a stratified random sampling design and includes sampling of fish and invertebrates using a bottom otter trawl, along with physical oceanographic and plankton sampling. These surveys are the primary data source for monitoring trends in species distribution, abundance, and biological condition within the region.

There were changes to the net used and the vessel conducting the survey in 1982 and 1983, along with some changes in data collection protocols. While the vessel change in 1983 would not be expected to strongly influence catches, the change in trawl in 1982 should impact catch. The Yankee 36 trawl used from 1970–1981 had a slightly narrower wingspread and a lower headline and smaller footgear than the Western IIA (WIIA) (Figure 1). These differences in trawl configuration would be expected to lead to higher catches of fish that disperse up into the water column with the WIIA, but also lower catches for the WIIA of fish that are strongly associated with the substrate or whose escape response when frightened is to hide on the sea floor. Conversion factors were calculated for only a limited number of commercial species. Conversion factors calculated by Fanning (1985) range from about 0.8 for American Plaice, Yellowtail Flounder, Witch Flounder, and Winter Flounder to 1.2 for Haddock. For most other species, no conversion factor has been calculated for the change in trawl. For species that have no conversion factor, abundance and biomass indices for the period 1970–1981 may not be directly comparable to those from subsequent years. For long-term averages, the most appropriate starting point has been selected for each species (for details see Clark and Emberley, 2011).

Since 1983, the primary vessel used to complete the Summer Ecosystem RV Survey of the Scotian Shelf and Bay of Fundy has been the CCGS Alfred Needler (Figure 1). In years where the CCGS Alfred Needler was unavailable for the survey, the CCGS Teleost (2004, 2007, 2018, 2022 and 2023) or the CCGS W. Templeman (2008) were used. All vessels used the WIIA trawl and followed the same protocols but there were differences in vessel characteristics between the CCGS Alfred Needler and the CCGS Teleost. In order to test potential differences between vessel catchabilities for a large number of taxa of interest, a comparative fishing experiment was conducted in the summer of 2005 between the two vessels (Figure 1). Data analysis was conducted in 2009 (Fowler and Showell, 2009) but was ultimately considered unreliable for most species by researchers and stock assessment biologists in the Region. To date, survey data collected by the CCGS Alfred Needler and CCGS Teleost have been considered comparable.

In preparation for the replacement of the CCGS Alfred Needler and CCGS Teleost by the new Offshore Fisheries Science Vessels (OFSV), the CCGS Captain Jacques Cartier and CCGS John Cabot, a comparative fishing experiment was planned to begin in the summer of 2021. At this time, the CCGS Alfred Needler was unavailable due to mechanical issues which persisted until the vessel was ultimately decommissioned in February of 2023. Consequently, the CCGS Teleost was used to conduct comparative fishing with the new vessels in the summers of 2022 and 2023 (Figure 1). As such, there was a need to analyze the 2005 comparative fishing experiment between the CCGS Alfred Needler and CCGS Teleost, such that time series of catch data from the survey across the past four decades employing four different vessels could be consistently maintained and integrated. Re-analysis of the 2005 comparative fishing data resulted in conversion factor recommendations for a number of species, however, the results generally showed no significant difference in catch efficiency between the CCGS Alfred Needler and CCGS Teleost for most species reported in this document with the exception of Redfish, American Plaice, and Spiny Dogfish (Yin et al., in press(b)). The conversion factors recommended for redfish, American Plaice and Spiny Dogfish were used in the analyses within this report.

In 2021, the CCGS Captain Jacques Cartier and CCGS John Cabot were introduced to the fleet of Coast Guard Science vessels to replace the CCGS Alfred Needler and CCGS Teleost (Figure 1). The CCGS Captain Jacques Cartier and CCGS John Cabot are sister ships with identical designs and are thus considered interchangeable platforms for the purpose of the Ecosystem Surveys. In addition to the change in RV, the Maritimes Region adopted a new

bottom trawl (Northwest Atlantic Ecosystem Survey Trawl; hereafter the NEST) to replace the WIIA trawl. Although the wingspread of the WIIA and NEST trawls are similar, the NEST has finer mesh, a higher net opening, and uses a rockhopper footgear which are expected to reduce escape of species under and over the net while also reducing the variability of catchability in the size and age of species caught. The NEST also uses much lighter and smaller doors compared to the WIIA. Alongside the physical differences between the gear, the fishing protocols also differ. Historically, the fishing protocol for a standard tow using the WIIA has been 30 minutes in duration at a speed of 3.5 knots, with tow time beginning as soon as all warp is deployed and winches locked, for a total distance of 1.75 nautical miles. The fishing protocol followed by the new OFSVs using the NEST includes a tow duration of 20 minutes at a speed of 3 knots, with tow time beginning at the moment the trawl touches down on bottom, for a total tow distance of 1 nautical mile. Both fishing protocols end their respective tows when winches are initiated for haul back.

To account for potential differences in catch efficiencies between the vessel/gear/protocol combinations, a comparative fishing experiment was conducted in the summers of 2022 and 2023 between the CCGS Teleost and CCGS John Cabot (2022)/ CCGS Captain Jacques Cartier (2023) (Figure 1). Based on the results of the comparative fishing analyses, conversion factors were recommended for a multitude of taxa to allow for comparisons between the historical time series and future indices (Yin et al. in press (a)). For this report, conversion factors are applied to data from the 2021 and 2024 surveys that were completed by the CCGS Captain Jacques Cartier. Conversion factors are also applied to a number of sets completed by the CCGS Captain Jacques Cartier in 2023 when the CCGS Teleost was not present during the comparative fishing survey. This was to fulfill the minimum sampling requirements for strata that did not receive sufficient coverage by the CCGS Teleost, which was the primary vessel used in 2023. For more information on the 2005 and 2022/2023 comparative fishing experiments, analyses and results, please see Yin et al. (in press (b)) and Yin et al. (in press (a)), respectively.

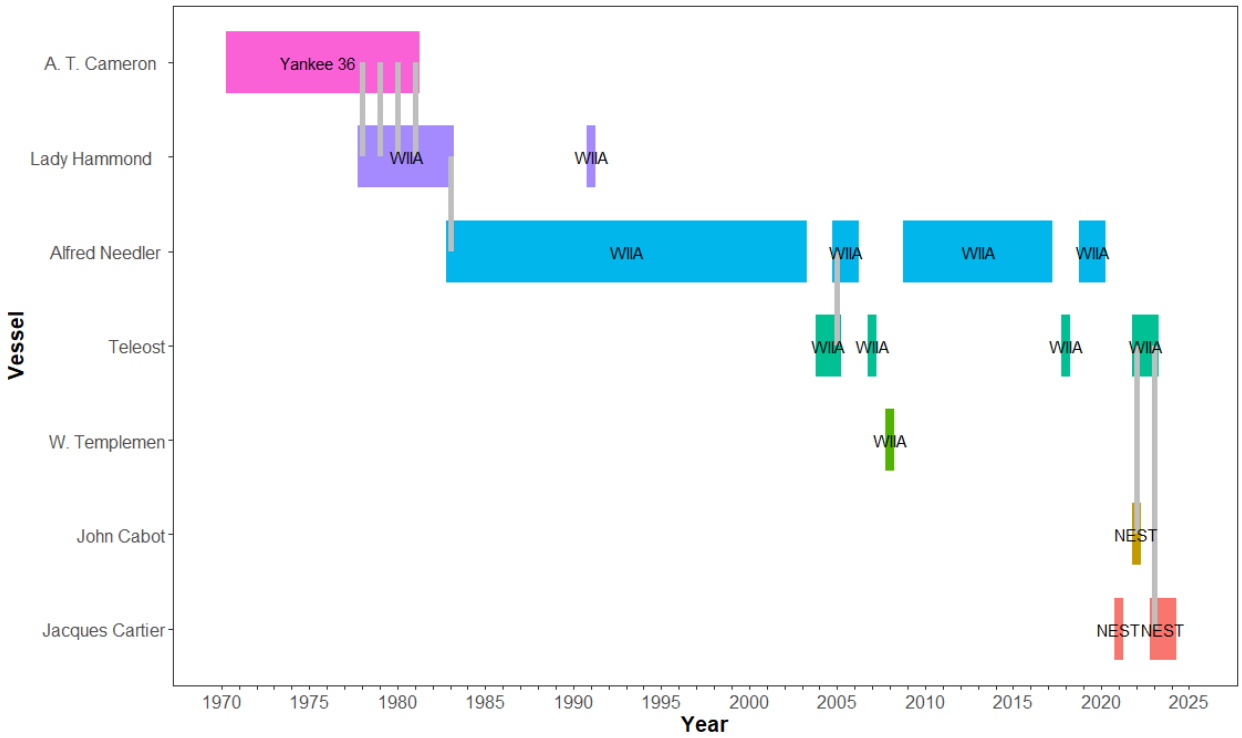

Figure 1. Vessels and trawl gear used during the Summer RV Survey throughout the time series. Vertical grey bars denote years when comparative fishing experiments were performed and between which vessels/trawl gear.

The bottom trawl surveys were designed to provide abundance trends for fish within NAFO Divisions 4VWX and DFO statistical unit area 5Yb (Figure 2) between depths of about 30 m to 400 m. Survey indices are expected to be proportional to abundance for most species.

Strata boundaries are shown in Figure 3 for the 4VWX5 area. The areas of Georges Bank (strata 5Z1, 5Z2, 5Z3 and 5Z4), Browns Bank (stratum 480), the Fundian Channel (stratum 5Z9), the Laurentian Channel (strata 558 and 559) and areas surrounding the Gully Marine Protected Area (strata 450 and 452) can all be important for species biomass and diversity (Figure 3). From 1970–1995, sampling was generally restricted to strata 440–495. Spatial coverage was extended to the Scotian Shelf slope (strata 496–498) in 1996 and the Fundian Channel (stratum 5Z9) in 2011. The sampled area expanded to include strata 558 and 559 in 2014 and stratum 5Z2 in 2016 and now regularly includes all offshore waters of the Maritimes Region down to a depth of 750 m.

Catch distribution plots for the entire Summer Ecosystem RV Survey area are provided for a suite of species that are commonly caught in the 4VWX groundfish fishery. Biomass index trends are shown for the area appropriate for each stock. Comparisons of 2023 and 2024 numbers-at-length (NAL) from the survey catch to the long-term median (from beginning of survey series, or the period deemed appropriate for that particular species, to 2022) are also included, using data from the geographic areas that are used in assessments for those stocks.

All strata from 440–495 have had some sampling annually since 1970 with the exception of 2018, 2021 and 2022. In all three years, sampling was conducted in all standard strata in 4X5Yb, as well as 5Zc in 2021 and 2022, but the majority of the survey area, including all of 4V

and most of 4W were not sampled due mostly to mechanical problems with vessels. Of the 280 stations selected for sampling in 2018, 2021 and 2022, only 85, 107 and 153 successful tows were completed, respectively. Therefore, for most stock areas that include strata in 4V or 4W, data for years 2018, 2021 and 2022 are excluded.

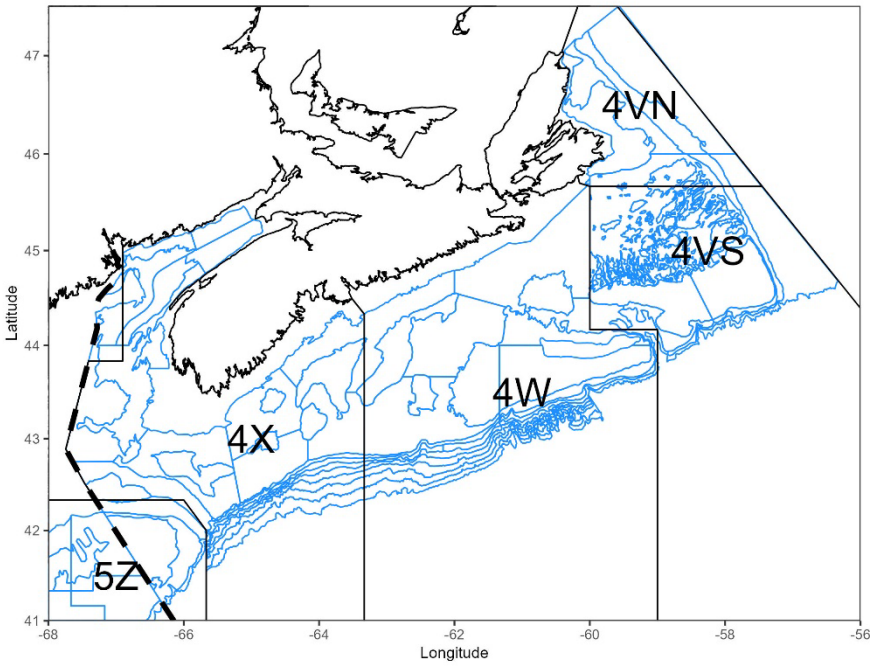

Figure 2. Northwest Atlantic Fisheries Organization (NAFO) Divisions. Dashed line represents the border between Canada and United States of America.

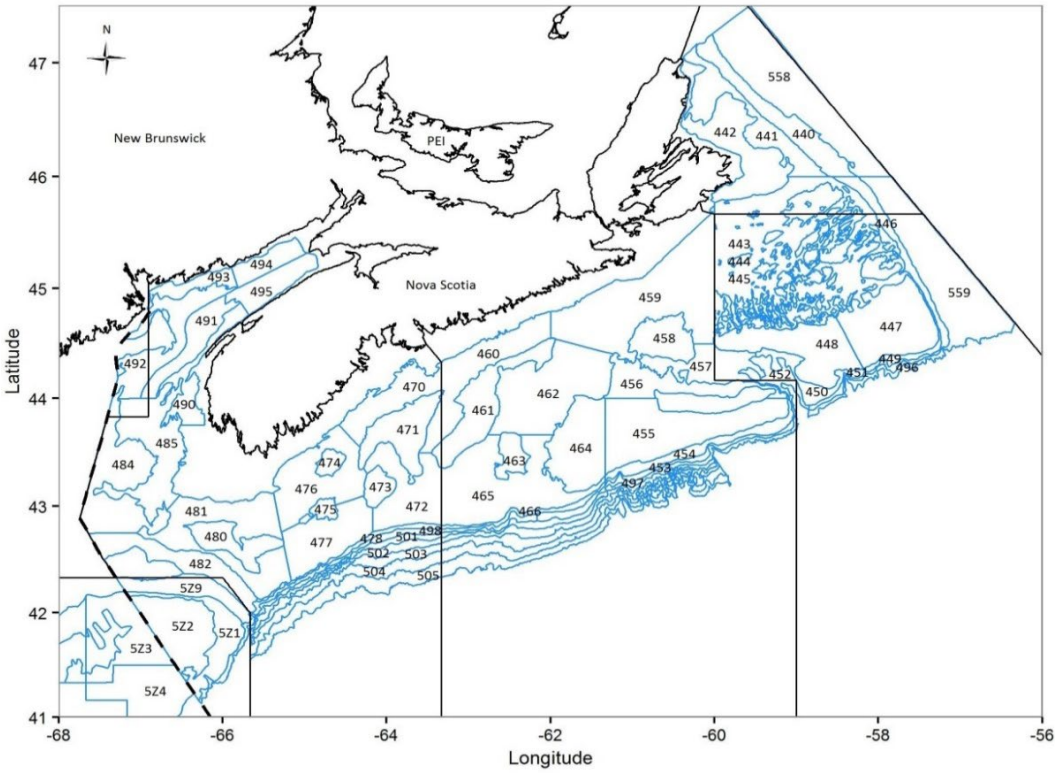

Figure 3. Fisheries and Oceans Canada Maritimes Region Summer Ecosystem Research Vessel Survey strata.

ANALYSIS

The stratified random survey design ensures that sampling takes place throughout the range covered by the survey. The strata were originally selected to represent different depths and habitats. Sampling occurs at randomly selected stations within all strata. The data are averaged within each stratum, weighted by stratum area, and then summed over all appropriate strata for each stock. While this ensures that sampling is representative of the entire area, low sampling intensity means that there is high variability, particularly for stocks that are highly aggregated or that inhabit only a small part of the entire survey area. Thus, single data points in the biomass series should be interpreted with caution as large inter-annual changes could simply reflect variability in the data rather than changes in population abundance. Comparisons between the long-term and short-term averages may be more useful for representing the relative status of the population. Large inter-annual changes could also reflect the appearance of a strong year-class or, conversely, the impact of a single large tow; thus, biomass indices should be interpreted with reference to the NAL data and the distribution of catches to see if these data aid interpretation.

In 2024, 244 successful fishing tows were completed by the CCGS Captain Jacques Cartier of 282 planned between June 26 and August 5. Six fishing days of 42 planned were lost due to various mechanical and non-mechanical reasons. All survey strata in NAFO Divisions 4VWX5c were covered with the exception of stratum 497 where only one valid set was completed, and the deep water strata along the Scotian shelf edge (501–505, 560; 732–2000 m) which were missed entirely. Effort was made to complete the minimum required number of two stations in

stratum 497, however, no suitable bottom could be found at any of the remaining station locations. Stratum 497 was first added to the survey in 1995 to extend the depth range to 732 m to ensure the spatial coverage included the range for redfish stocks along the shelf, however, it is not currently included in redfish assessments. The deep water strata (501–505, 560) were created in 2011 with the intention they would receive minimal sampling in most years (as time permitted), with higher sampling once every five years, and are not currently used in any stock assessments.

In total, 81,549 fish and invertebrates were measured and over 350 species were observed in 2024. Oceanographic data collection comprised of 239 CTD-rosette casts, 51 vertical zooplankton tows and 1,152 water samples including eDNA sampling across DFO's marine conservation areas on the Scotian Shelf. Halifax Hydrographic Station was also completed four times over the course of the survey.

Biomass indices for each stock are calculated using the set of strata which are included in calculating indices for the stock assessment. As no assessments have integrated data from strata added since 1996 (496–498, 558–559, 5Z1, 5Z2, 5Z9), these data are not included in time-series trends. For some stocks, where these deeper water strata, or strata from Georges Bank, appear to be important parts of the stock distribution, the potential contribution to biomass indices of these strata has been discussed.

The time series of survey biomass indices and the three-year (3-yr) running geometric mean (GM) are compared to 40% and 80% of the long-term GM to provide context for biomass levels. The GM was selected for these comparisons to reduce the impact of very high values observed in some years. The values are presented in Table 1.

Table 1. Summer Ecosystem Research Vessel Survey biomass indices (tonnes) for species by stock/region for 2022, 2023, 2024, current 3-yr geometric mean (GM) biomass index (2022, 2023, 2024), and 40% and 80% of the long-term GM biomass index (1970–2023). NA = not available.

Species/Area	2022	2023	2024	Current 3-yr GM	40% Long-term GM	80% Long-term GM
Atlantic Cod 4X	1,335	3,242	1,136	1,700	4,762	9,524
Atlantic Cod 4Vn	NA	1,979	1,607	1,625	2,967	5,934
Atlantic Cod 4VsW	NA	8,212	4,691	11,234	10,293	20,585
Haddock 4X	35,903	89,398	38,140	49,653	20,006	40,012
Haddock 4VW	NA	14,645	20,783	15,711	18,328	36,655
White Hake 4X	6,289	6,562	2,955	4,959	5,345	10,690
White Hake 4VW	NA	1,469	821	1,434	2,813	5,626
Silver Hake 4VWX*	NA	47,277	35,820	30,927	12,810	25,620
Silver Hake 4X West*	39,403	43,716	9,352	25,255	1,628	3,256
Pollock Eastern Component	NA	3,267	8,197	5,730	6,739	13,478
Pollock Western Component	5,034	24,550	4,221	8,050	7,762	15,525
Redfish 4VWefghj	NA	57,230	42,273	37,694	12,182	24,363
Redfish Unit III	33,954	52,609	48,625	44,286	22,814	45,627
American Plaice 4X	294	501	374	380	647	1,293
American Plaice 4VW	NA	11,264	3,546	5,753	8,745	17,489
Witch Flounder 4X	524	1,112	974	828	615	1,230
Witch Flounder 4VW	NA	9,538	3,373	5,797	1,655	3,311
Yellowtail Flounder 4X	63	202	113	113	161	323
Yellowtail Flounder 4VW	NA	8,974	6,082	5,915	4,801	9,601
Winter Flounder 4X	3,499	5,604	2,481	3,651	1,114	2,228
Winter Flounder 4VW	NA	288	193	256	243	487
Atlantic Halibut 4VWX	NA	12,458	11,511	11,352	1,462	2,925
Atlantic Wolffish 4X	226	139	111	152	374	748
Atlantic Wolffish 4VW	NA	288	351	290	468	937
Monkfish 4X	1,033	4,458	2,755	2,332	647	1,294
Monkfish 4VW	NA	1,138	1,285	1,209	798	1,596
Smooth Skate 4X	292	506	269	342	148	297
Smooth Skate 4VW	NA	271	86	136	115	231
Thorny Skate 4X	69	325	181	159	597	1,193
Thorny Skate 4VW	NA	4,870	1,892	2,032	2,461	4,921
Barndoor Skate 4X ŧ	3,536	3,326	2,156	3,326	NA	NA
Barndoor Skate 4VW ŧ	NA	1,418	761	893	NA	NA

Species/Area	2022	2023	2024	Current 3-yr GM	40% Long-term GM	80% Long-term GM
Winter Skate 4X	633	437	723	585	254	509
Winter Skate 4VW	NA	2,934	915	457	508	1,015
Little Skate 4X	2,030	824	746	1,077	203	406
Little Skate 4VW	NA	319	160	165	14	27
Longhorn Sculpin 4X	1,035	1,642	1,455	1,352	513	1,026
Longhorn Sculpin 4VW	NA	6,552	264	1,433	890	1,781
Spiny Dogfish 4VWX	NA	82,157	79,156	76,011	30,896	61,792
Red Hake 4X *	7,332	5,395	1,857	4,188	552	1,105
Red Hake 4VW *	NA	1,134	1,103	1,030	385	770
Ocean Pout 4X	49	140	309	128	237	473
Ocean Pout 4VW	NA	24	65	31	77	153
Sea Raven 4X	1364	928	907	1047	892	1,783
Sea Raven 4VW	NA	854	175	628	487	973
Short-fin Squid 4VWX	NA	2,729	480	3,572	3,529	7,058

NA–Indices not available due to reduced spatial coverage of the 2022 survey. For these stocks, the current 3-yr GM is calculated using the biomass indices from 2020, 2023, and 2024.

* For Silver Hake and Red Hake, the long-term average time series begins in 1982.

t For Barndoor Skate the current 3-yr geometric mean is replaced by the current 3-yr median and the 40% and 80% long-term geometric mean is NA due to numerous years of catches of zero early in the time series.

The time series of NAL indices are compared with long-term (full time series) and short-term (ten years) median values to provide context on population length composition for each stock. For stock areas that did not receive full coverage in some years (e.g., 2018, 2021, 2022), the short-term median was extended to include the most recent 10 years where data exist.

For some species, including Silver Hake and Haddock, modes are apparent in the NAL data at smaller sizes that are comprised primarily of individual year-classes, providing information on relative NAL of pre-recruit ages.

For all stocks in 4X5Yb, short-term and long-term GM values include data up to 2023 and 3-yr GM values are calculated using data from 2022, 2023 and 2024. Biomass and numbers-at-length indices for stocks that extend into 4VW are updated to 2024; however, the current 3-yr GM was calculated using 2020, 2023 and 2024 data due to missed coverage in 2021 and 2022, with the exception of Unit 3 redfish which included 2022, 2023 and 2024 data.

Of note in the data, particularly for Atlantic Cod and Haddock, is the increased NAL of young-of-the-year fish (Age 0) in recent years. The short-term median NAL shows a strong mode at below 10 cm for both Atlantic Cod and Haddock. This likely reflects earlier spawning and, thus, these fish, that in the past would have still been in the pelagic phase in July, are available to the summer survey in recent years.

The total biomass index for 4X shows high inter-annual variability but no clear trend over time (Figure 4a). The large drop in biomass from 2018 to 2019 reflects lower catches for most demersal species. The increase in total biomass in 2021, 2022 and 2023 is reflective of higher catches of redfish, Haddock, Silver Hake, Spiny Dogfish and Pollock, while 2024 catches had much fewer of those species and returned back to similar levels observed in 2019 and 2020.

In 4W, demersal fish biomass increased in the 1980s, but in the early 1990s, dropped back to the level observed in the 1970s (Figure 4b). The biomass for 2024 is similar to what it has been for the past five years with Silver Hake and Haddock composing the majority of the biomass.

In 4V, the demersal fish biomass dropped in the 1990s and has remained low since then (Figure 4c). The drop in the 1990s is mostly due to a large decrease in Atlantic Cod biomass and has since never recovered to pre-1990s levels. In 2024, the overall biomass remained similar to what has been observed in the past two decades with redfish comprising the majority of the biomass.

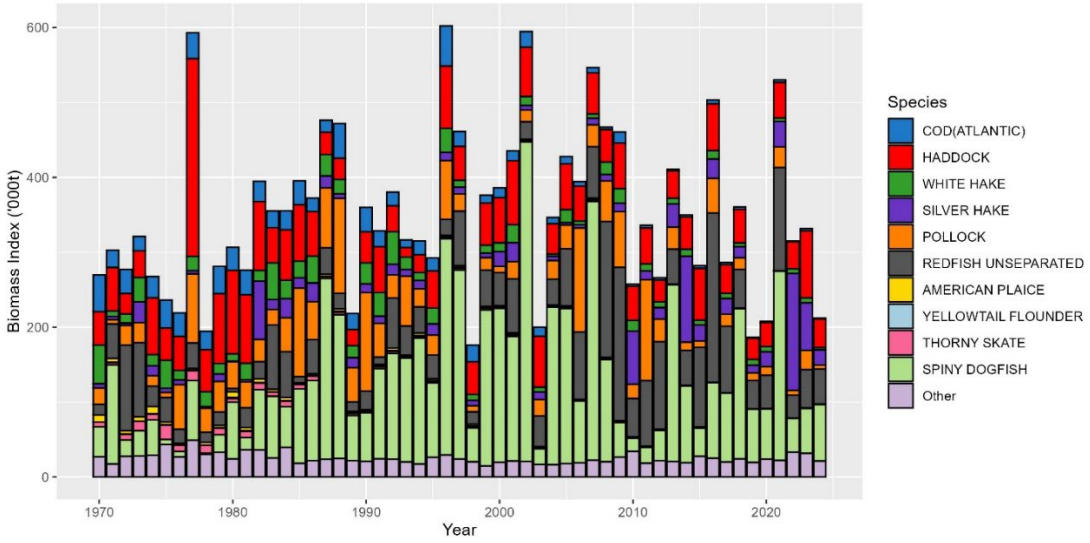

Figure 4a. Biomass indices for ten demersal fish species (bars) in 4X and for all other demersal fish species combined. Refer to Figure 2 for NAFO Divisions within the Maritimes Region.

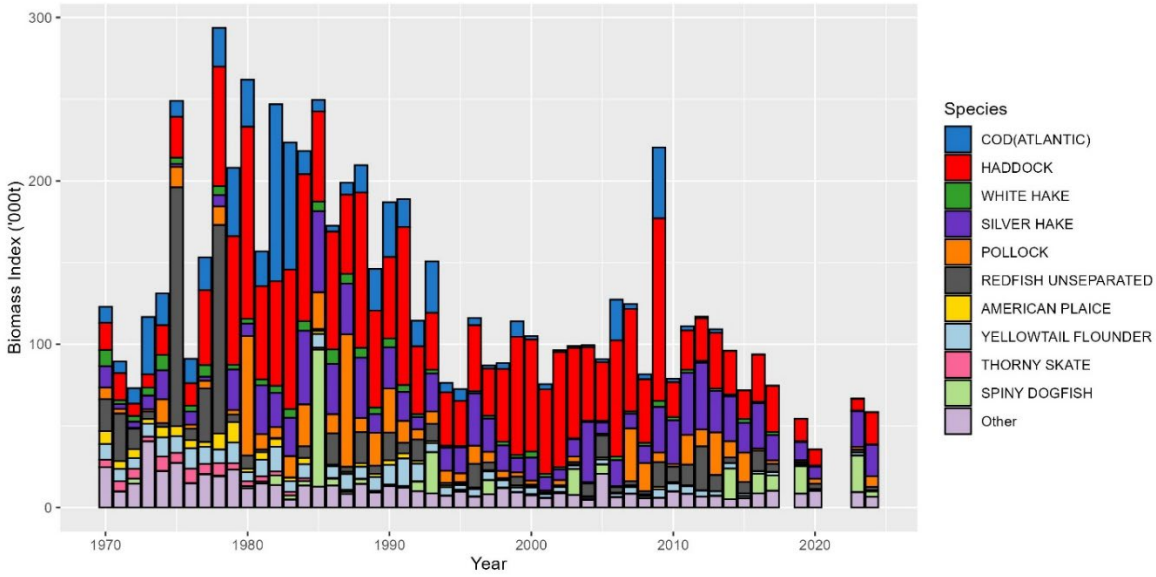

Figure 4b. Biomass indices for ten demersal fish species (bars) in 4W and for all other demersal fish species combined. Refer to Figure 2 for NAFO Divisions within the Maritimes Region. Data for 2018, 2021 and 2022 are missing due to incomplete survey coverage.

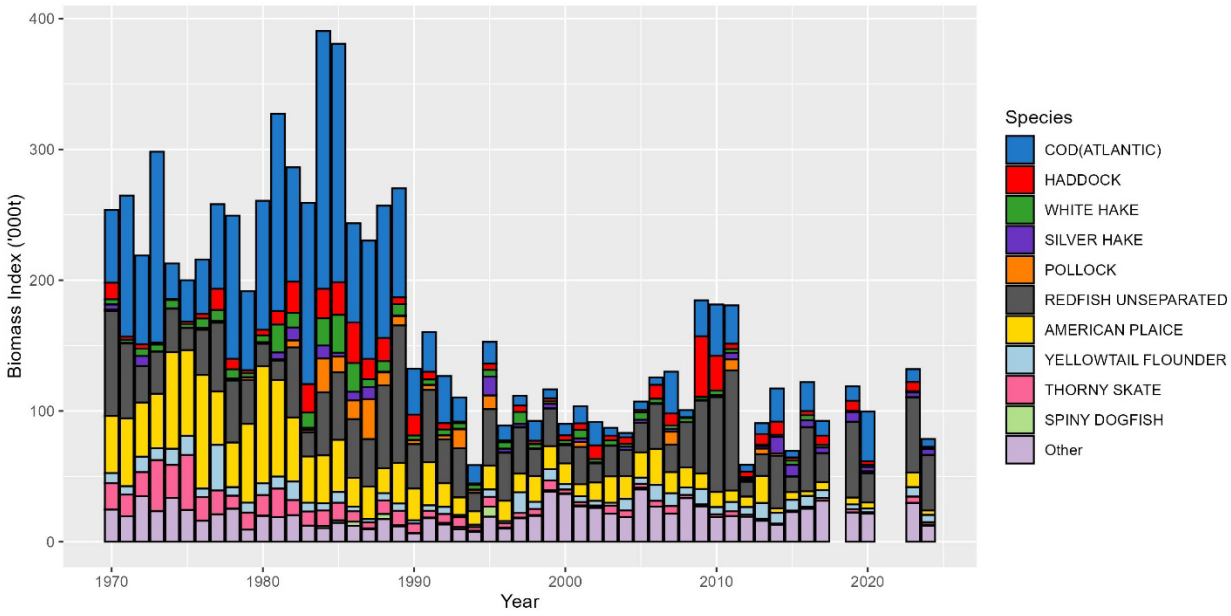

Figure 4c. Biomass indices for ten demersal fish species (bars) in NAFO Division 4V and for all other demersal fish species combined. Refer to Figure 2 for NAFO Divisions within the Maritimes Region. Data for 2018, 2021 and 2022 are missing due to incomplete survey coverage.

In 4X, Spiny Dogfish, redfish, and Haddock have made up the bulk of the demersal fish biomass index throughout the time series (Figure 4a). While Atlantic Cod and Thorny Skate have clearly declined over time, their combined biomass did not represent a large proportion of the total. In recent years, Pollock has experienced significant declines, however, these declines have been balanced by increases for other species like Silver Hake, so there has been no general decline in demersal fish biomass over time.

In 4W, increases in Atlantic Cod, Haddock, and Silver Hake biomass led to the increase in total demersal biomass in the 1980s (Figure 4b). However, redfish biomass, which made up the majority of biomass during the 1970s saw a large decline during the 1980s. Biomass indices for Atlantic Cod and redfish dropped to very low levels in 4W by the 1990s and were responsible for most of the overall decline in biomass. Haddock biomass has declined in 4W since 2010, and total demersal fish biomass in recent years has been the lowest in the time series.

In 4V, Atlantic Cod and American Plaice comprised a large part of the biomass index in the 1970s and 1980s but both have experienced large declines since (Figure 4c). Redfish did not experience the same drop in biomass and are the largest contributors to the 4V biomass indices in the last decade. Thorny Skate, White Hake, and Yellowtail Flounder biomasses have declined since the 1980s in 4V. The overall index has remained low since the early 1990s.

Atlantic Cod

The highest density of Atlantic Cod (*Gadus morhua*) catches occurred in 4Vn, although the largest catch (201 kg) occurred in 4Vs adjacent to The Gully Marine Protected Area (Figure 5a). The biomass index and 3-yr GM in 4X remains under 40% of the long-term GM and are both the lowest in the time series (Figure 5b). NAL in 4X are below the short-term and long-term medians for most lengths, however, indices for small fish between 4 and 8 cm are above the short-term

and long-term medians indicating an above average recruitment in 2024 (Figure 5c). In 4VsW, the 3-yr GM remains below 80% of the long-term GM. NAL in 4VsW for 2024 are generally similar to or below the short-term median values (Figure 5e). The 4Vn biomass index is below the 40% long-term GM (Figure 5f). NAL for most lengths in 2024 are similar to or above the short-term median, while a few lengths ranging from 24 to 34 cm exceeded the long-term median (Figure 5g).

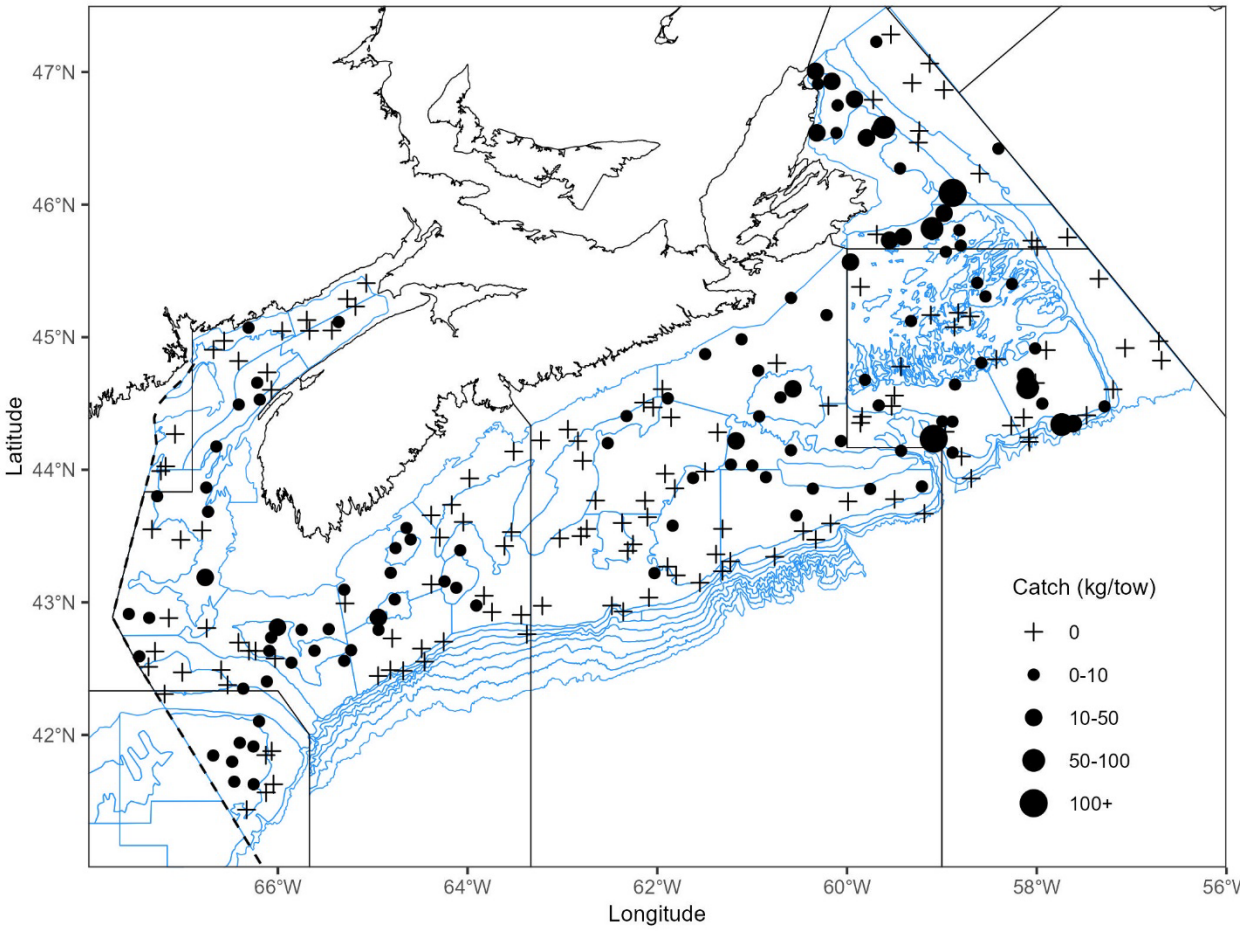

Figure 5a. Distribution of Atlantic Cod catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

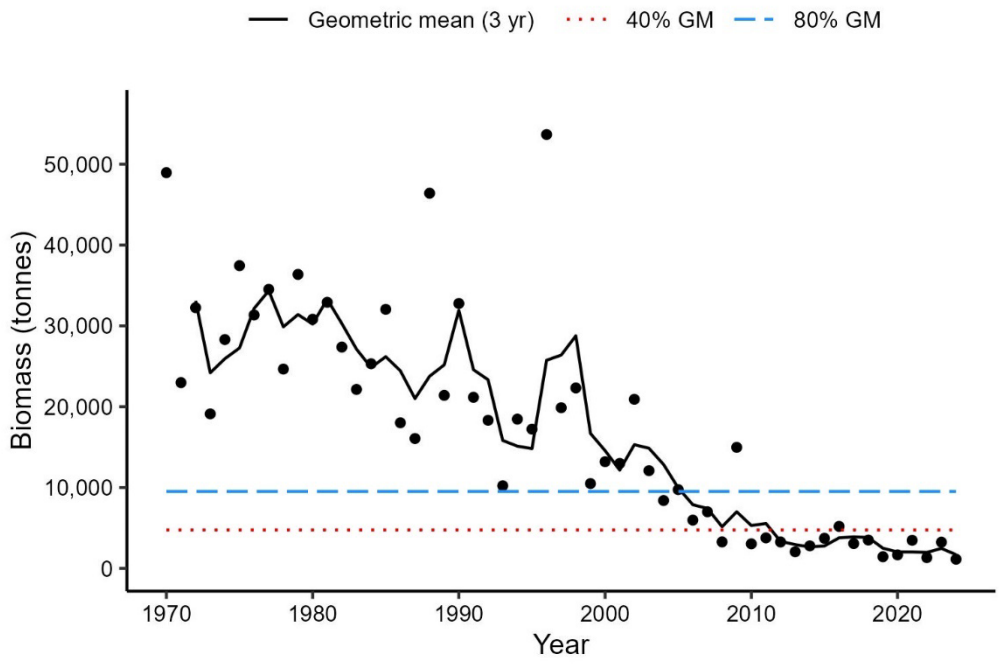

Figure 5b. Biomass index for Atlantic Cod in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

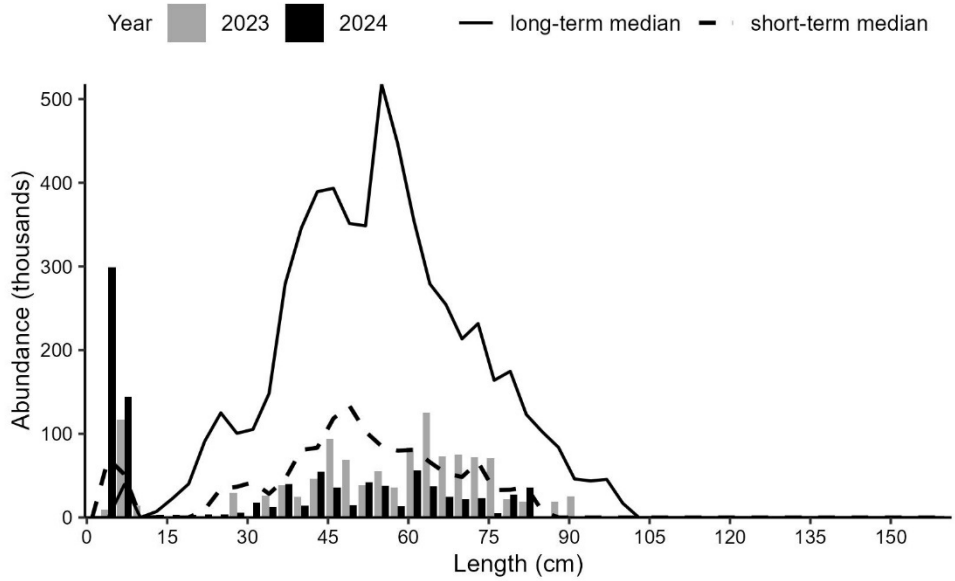

Figure 5c. Numbers-at-length (NAL) indices for Atlantic Cod in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

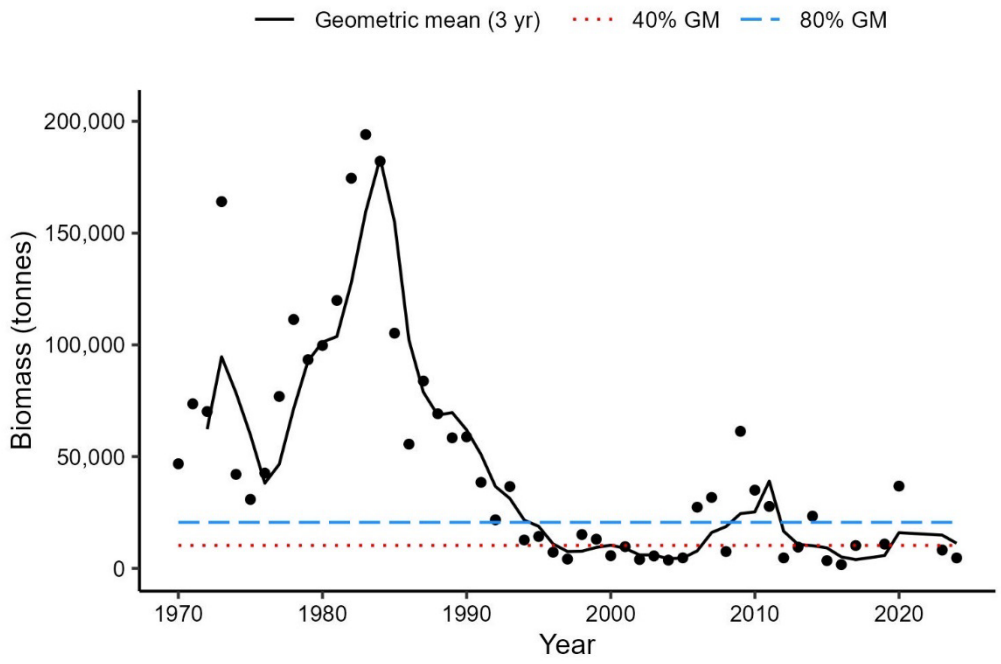

Figure 5d. Biomass index for Atlantic Cod in 4VsW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

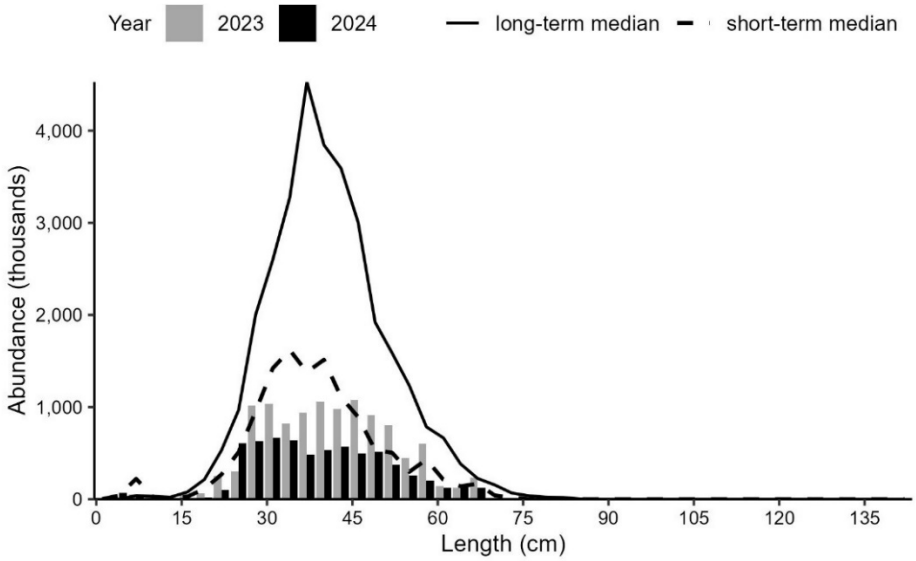

Figure 5e. Numbers-at-length (NAL) indices for Atlantic Cod in 4VsW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

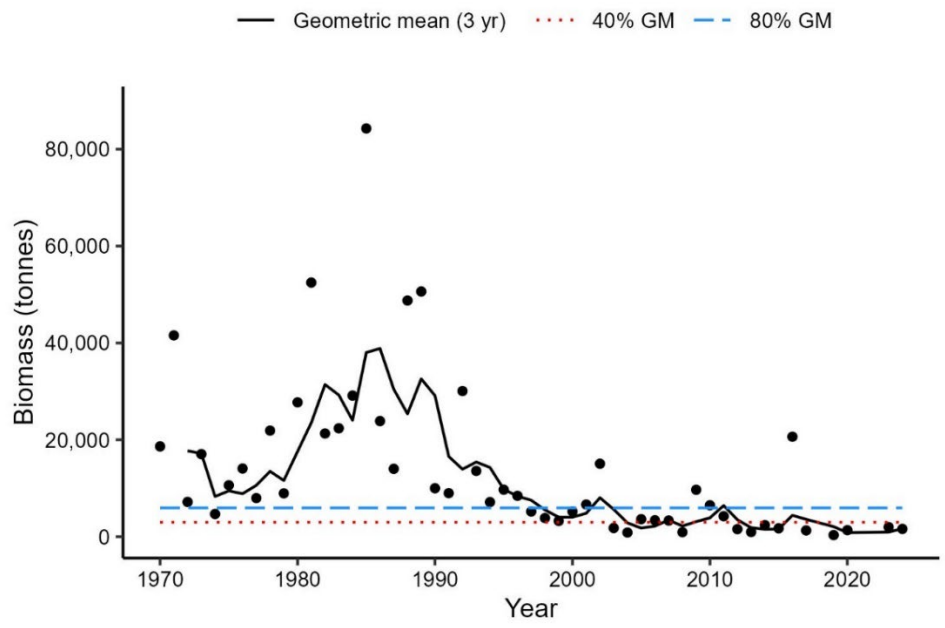

Figure 5f. Biomass index for Atlantic Cod in 4Vn from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

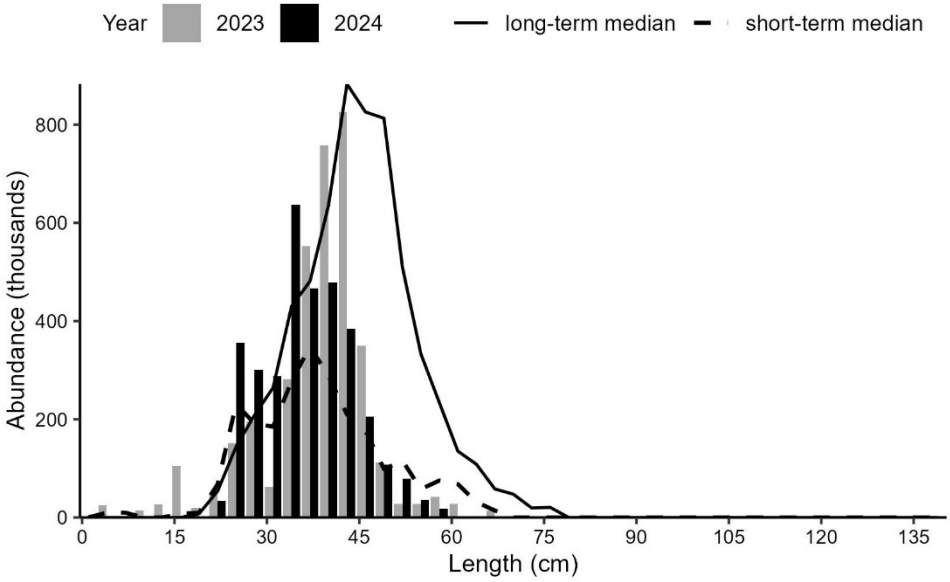

Figure 5g. Numbers-at-length (NAL) indices for Atlantic Cod in 4Vn from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Haddock

Haddock (*Melanogrammus aeglefinus*) were predominantly caught in 4X, 5Z and parts of 4W in 2024 with the highest density of larger catches (>100 kg) occurring on and surrounding Browns Bank (Figure 6a). The 2024 biomass index in 4X decreased from 2023 to below the 80% long-term GM, however, the 3-yr GM remains above this level (Figure 6b). NAL indices for fish between 30 and 45 cm are above both the long-term and short-term medians, while NAL of smaller and larger fish are generally below both medians (Figure 6c). NAL of age-0 Haddock (below 10 cm) are above the long-term median, but below the short-term median (Figure 6c). In 4VW, the 2024 biomass index increased and is above the 40% long-term GM (Figure 6d), however, the 3-yr GM remains below the 40% long-term GM. NAL indices are predominantly below both the short-term and long-term medians except for fish around 10 cm and 35 cm (Figure 6e).

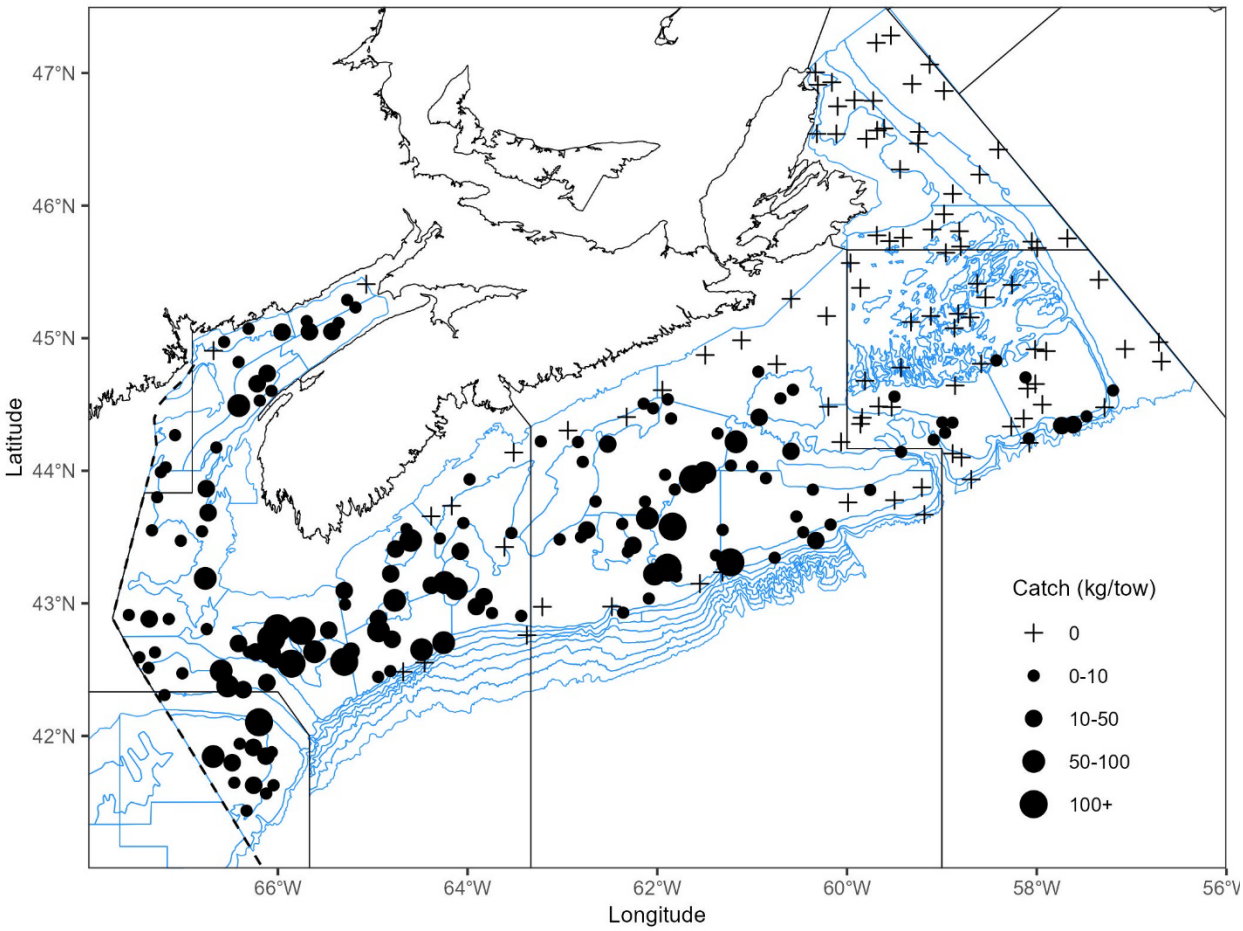

Figure 6a. Distribution of Haddock catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

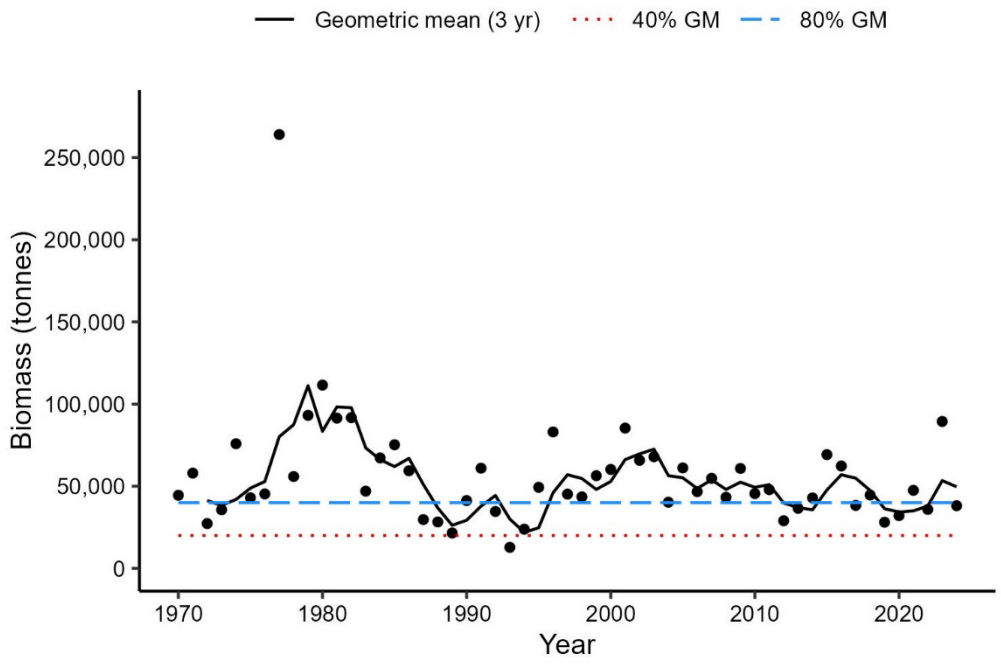

Figure 6b. Biomass index for Haddock in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

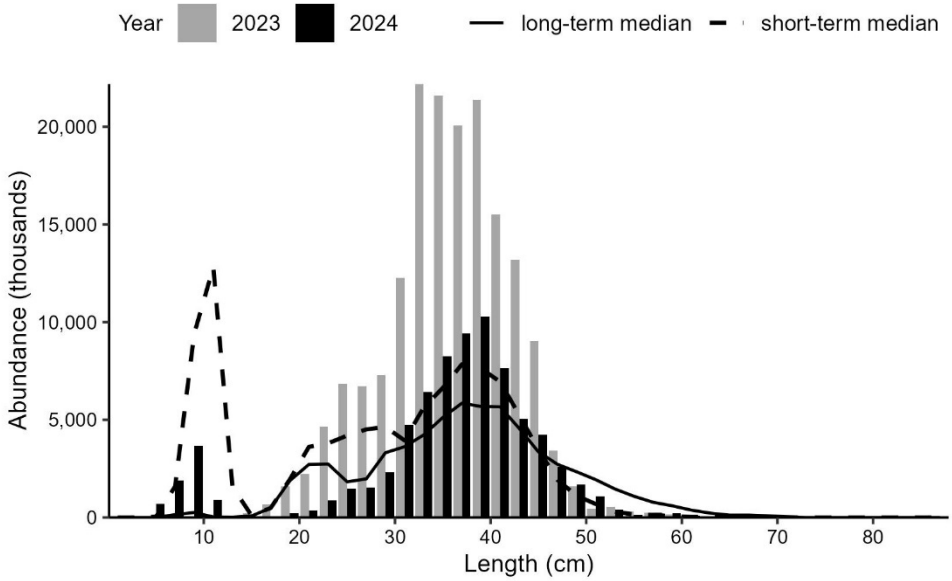

Figure 6c. Numbers-at-length (NAL) indices for Haddock in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

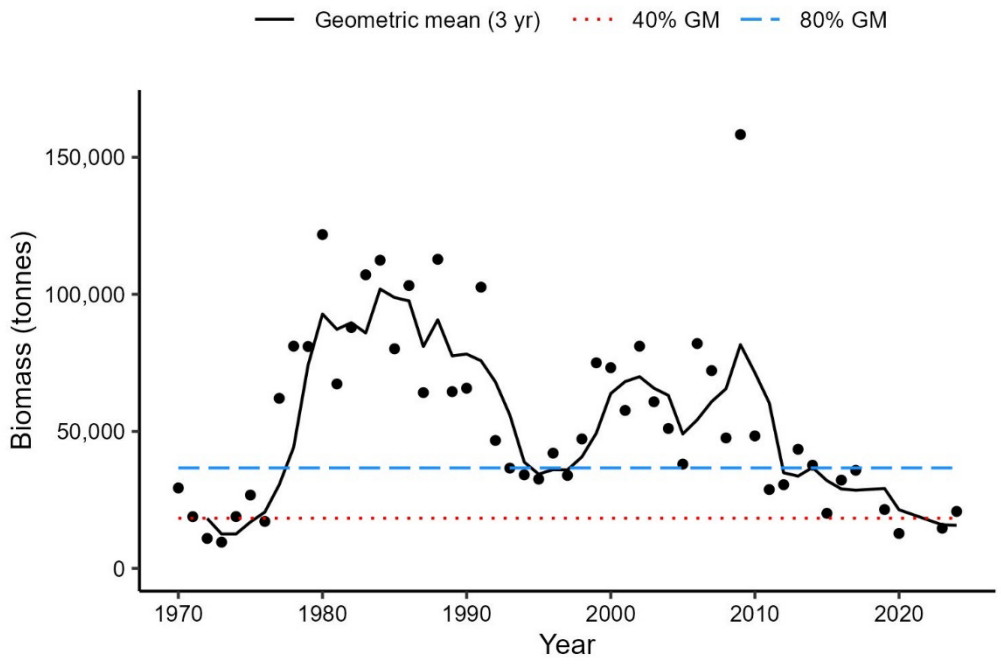

Figure 6d. Biomass index for Haddock in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

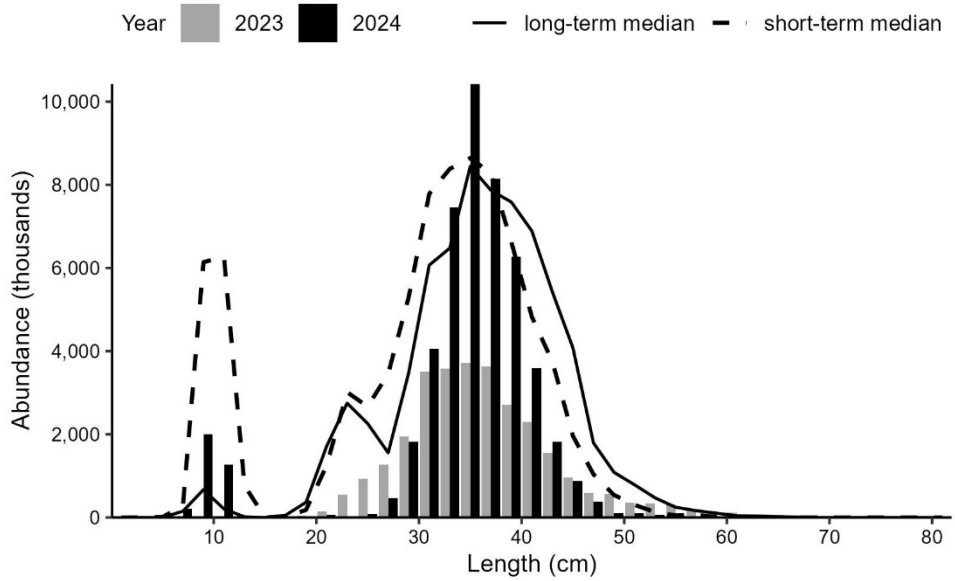

Figure 6e. Numbers-at-length (NAL) indices for Haddock in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

White Hake

Prior to 1982, small White Hake (*Urophycis tenuis*) and Red Hake (*Urophycis chuss*) were not easily distinguished (Clark and Emberley 2011). Therefore, NAL estimates for White Hake do not include data prior to 1982. Biomass estimates however, do include data prior to 1982 as any misidentified Red Hake would have made up a very small proportion of the total biomass (Bundy and Simon 2005).

White Hake were sporadically caught throughout the entire 4VWX area, however the largest catches occurred within the deeper waters of Georges Basin and in the Gulf of Maine (Figure 7a). In 4X, the biomass index decreased from 2023 to the second lowest in time series, and both the biomass index and 3-yr GM are below the 40% long-term GM. This marks the first time in the time series where the 3-yr GM fell below the 40% long-term GM and is the lowest in the time series (Figure 7b). NAL in 4X are below the short-term and long-term medians for most lengths in 2024 (Figure 7c). The 2024 biomass index and the 3-yr GM in 4VW remain below the 40% long-term GM and both are the lowest in the time series (Figure 7d). NAL in 2024 are also well below the short-term and long-term medians (Figure 7e).

The 2015 Recovery Potential Assessment (RPA) (Guenette and Clark 2016) proposed a biomass recovery target of 6,867 t mature (above 41 cm) biomass in 4X5Z and 3,885 t in 4VW. The 3-yr GM biomass index for 4X White Hake above 41 cm remains below the RPA-proposed biomass recovery target and has not exceeded this threshold since 2014 (Figure 7f). The 3-yr GM for 4VW mature White Hake (above 41 cm) has been below the RPA-proposed biomass recovery target since 1994 (Figure 7g).

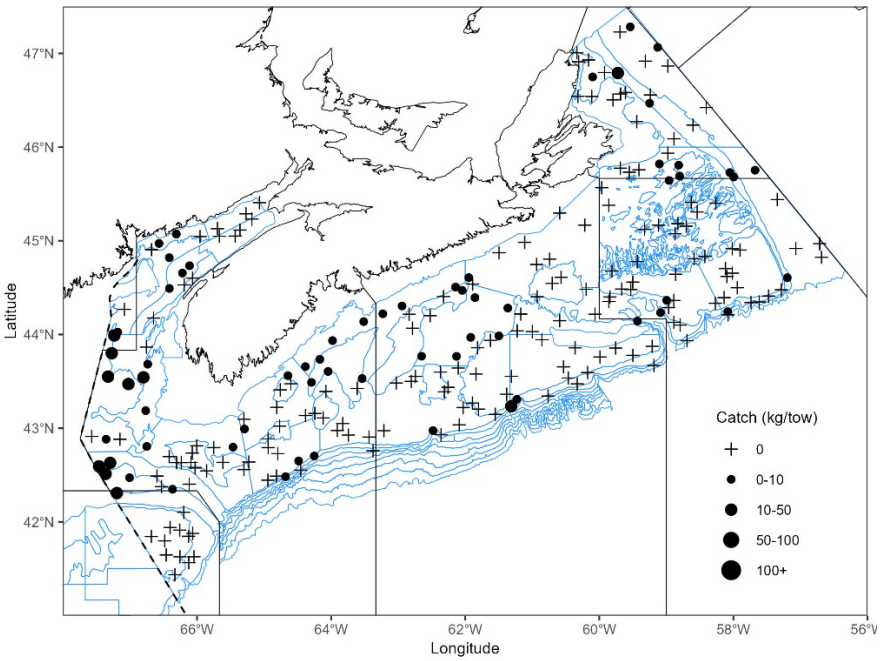

Figure 7a. Distribution of White Hake catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

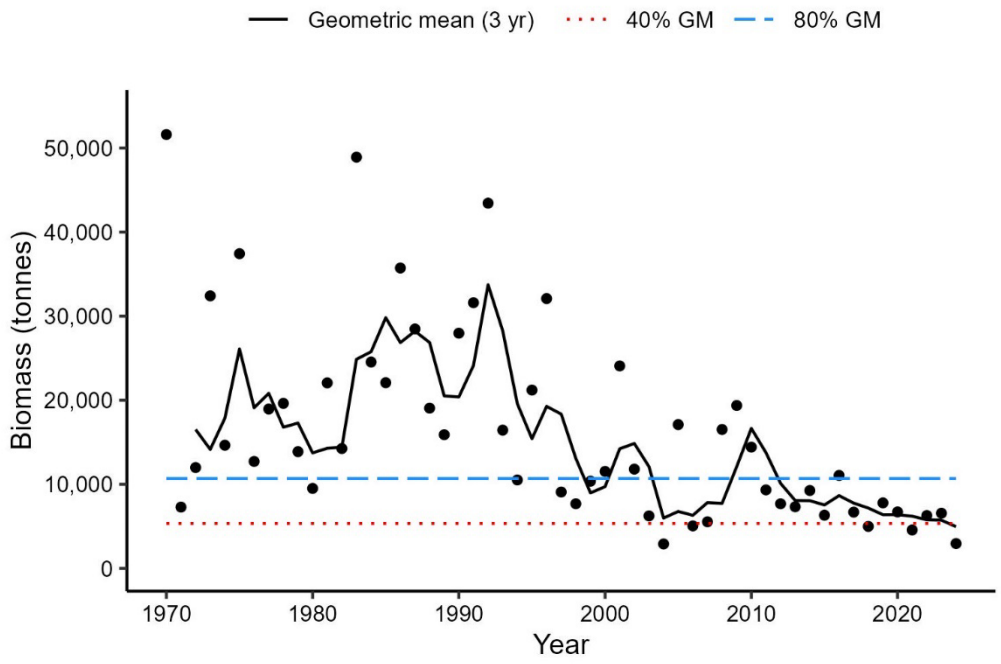

Figure 7b. Biomass index for White Hake in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

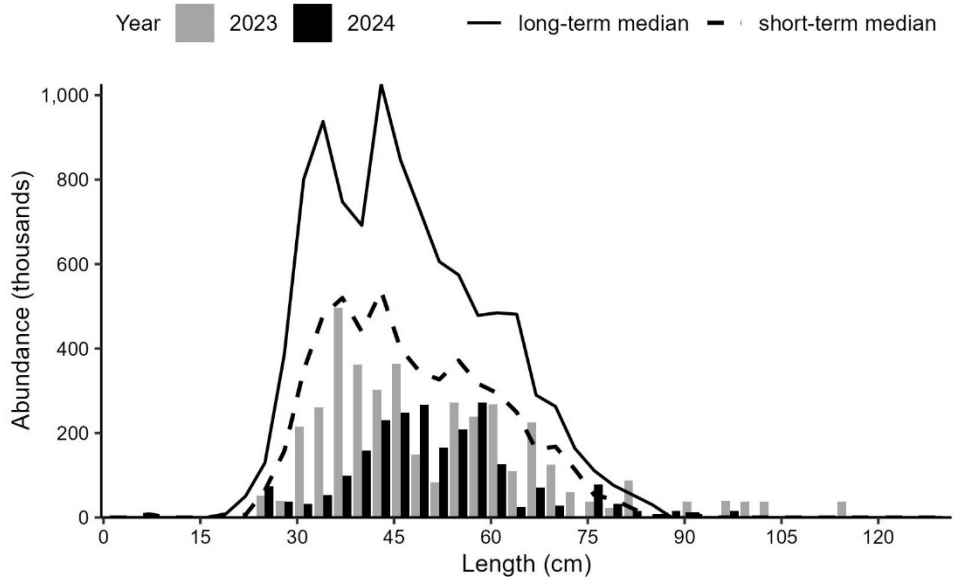

Figure 7c. Numbers-at-length (NAL) indices for White Hake in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1982–2022. The dashed black line represents the median NAL for the time period 2013–2022.

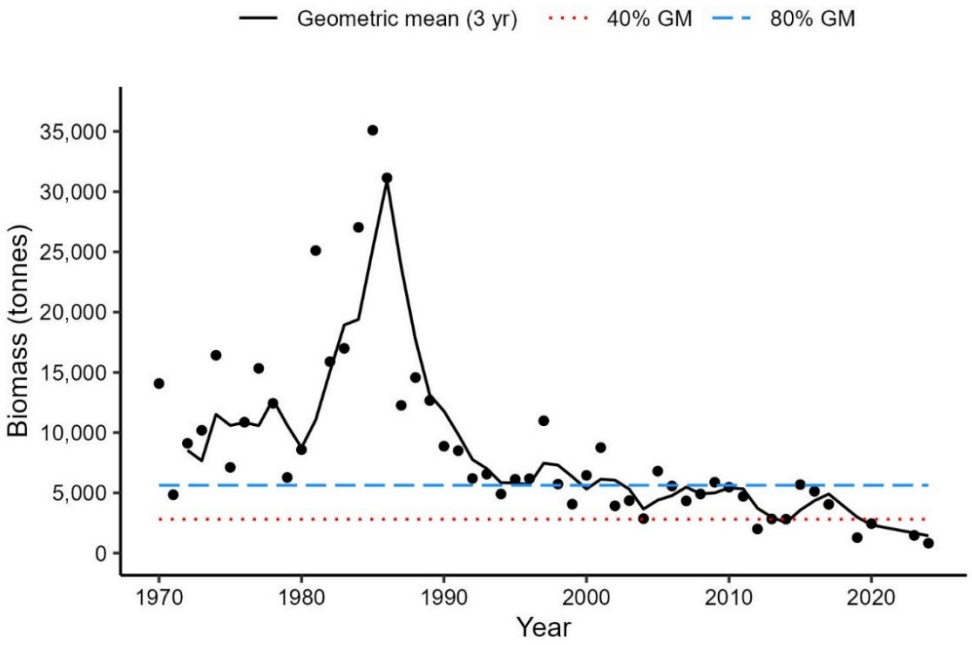

Figure 7d. Biomass index for White Hake in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

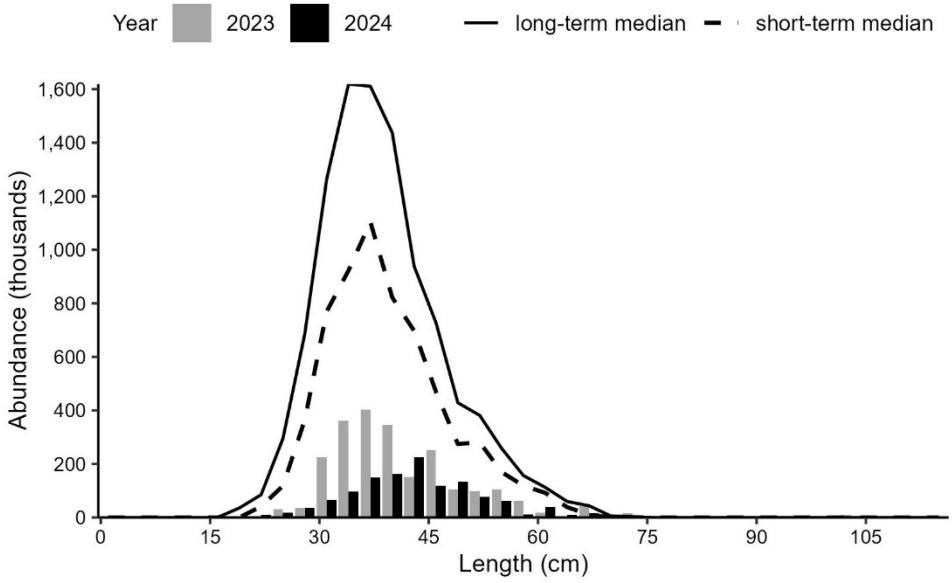

Figure 7e. Numbers-at-length (NAL) indices for White Hake in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1982–2020. The dashed black line represents the median NAL for the time period 2010–2020.

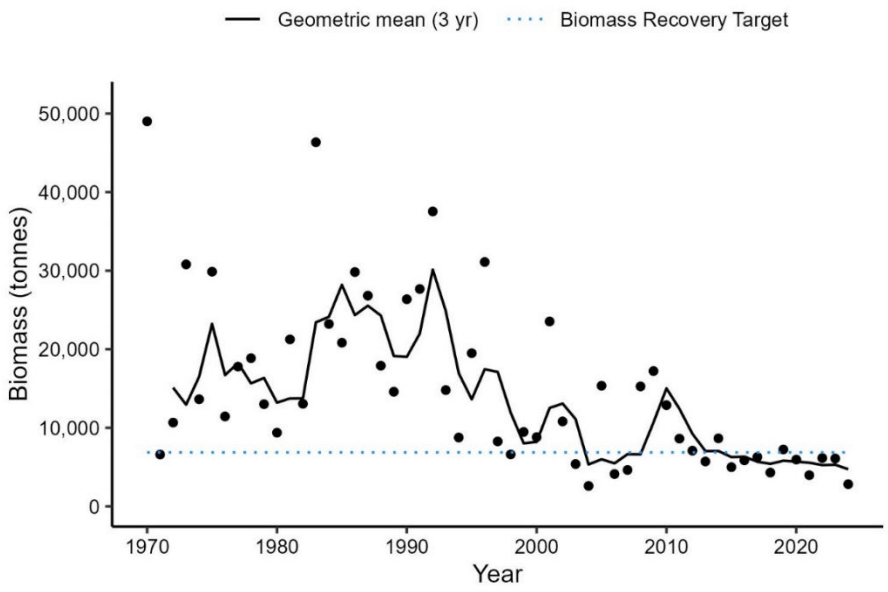

Figure 7f. Biomass index for 4X White Hake above 41 cm from the Summer Ecosystem RV Survey represented by the black circles. The solid black line represents the three-year geometric mean. The dashed blue line represents the proposed biomass recovery target (6,867 t).

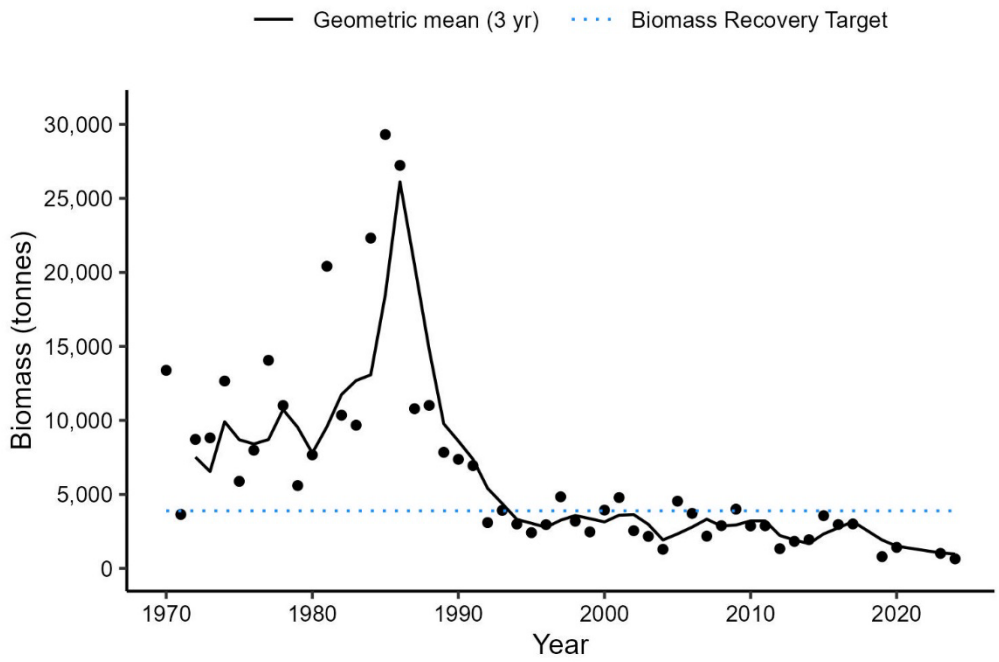

Figure 7g. Biomass index for 4VW White Hake above 41 cm from the Summer Ecosystem RV Survey represented by the black circles. The solid black line represents the three-year geometric mean. The dashed blue line represents the proposed biomass recovery target (3,885 t).

Silver Hake

Silver Hake (*Merluccius bilinearis*) were caught throughout most of the survey area in 2024 with the largest catches occurring in 4W and 4X (Figure 8a). The biomass index and the 3-yr GM for the 4VWX east stock (strata 440 to 483) are both above the 80% long-term GM (Figure 8b). NAL indices are generally similar to or above both the short-term and long-term medians for lengths above 25 cm (Figure 8c). In comparison to 2023, smaller fish below 25 cm showed a significant decline in NAL in 2024 and indices are below both the short-term and long-term medians. The 3-yr GM in the Bay of Fundy (4X west; strata 484 to 495) remains well above 80% of the long-term GM in 2024 even though the biomass experienced a large decline (Figure 8d). In 4X west, NAL of fish above 25 cm were above both the long-term and short-term median, however, smaller fish were essentially absent (Figure 8e).

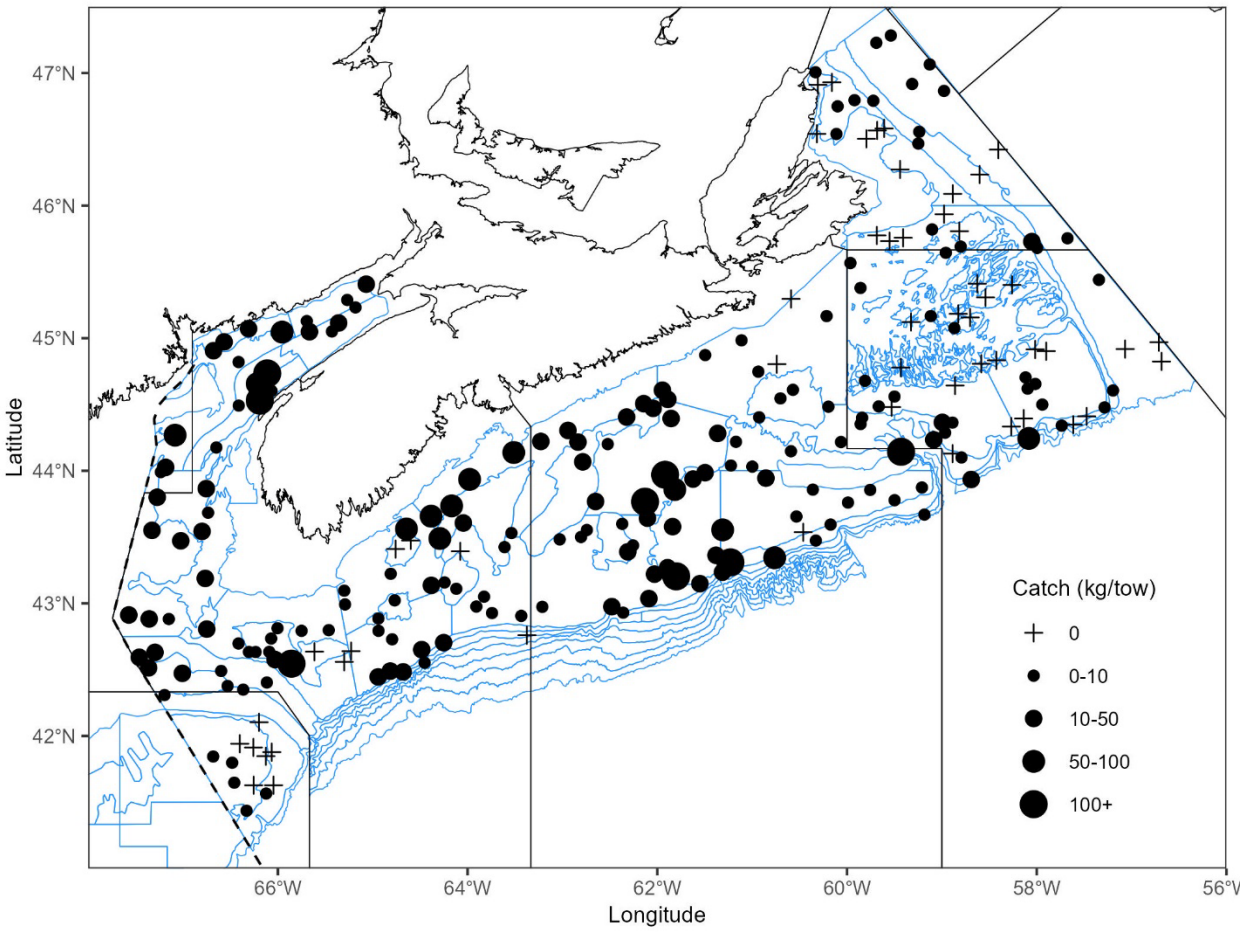

Figure 8a. Distribution of Silver Hake catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

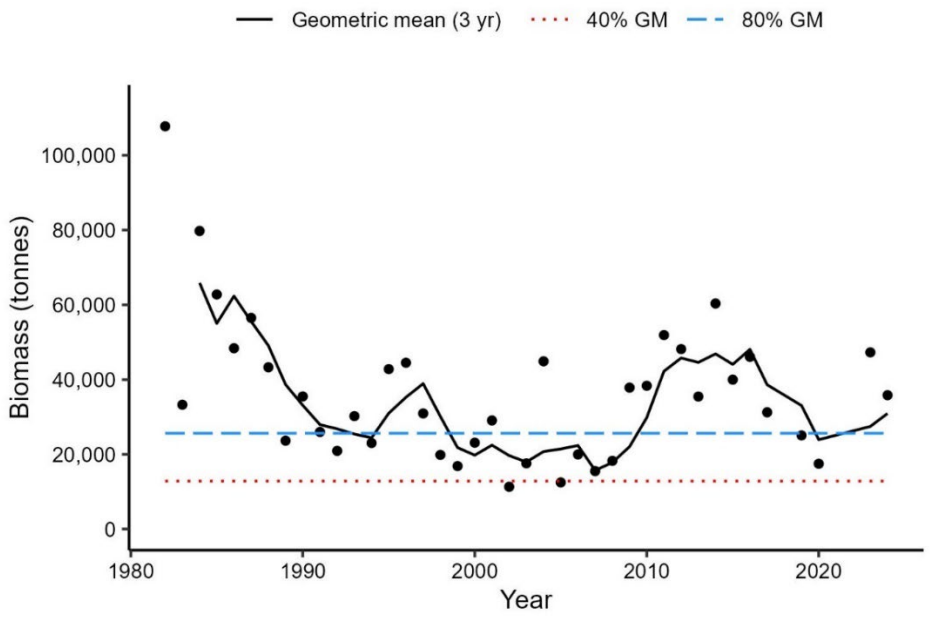

Figure 8b. Biomass index for Silver Hake in 4VWX east (strata 440–483) from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1982–2023), respectively. The black dots represent the biomass index for that year.

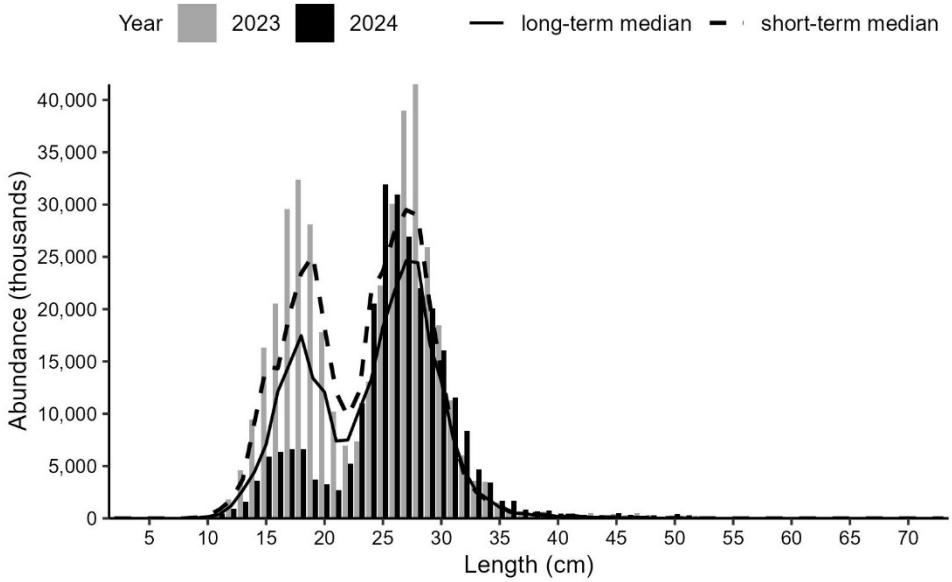

Figure 8c. Numbers-at-length (NAL) indices for Silver Hake in 4VWX east (strata 440–483) from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1982–2020. The dashed black line represents the median NAL for the time period 2010–2020.

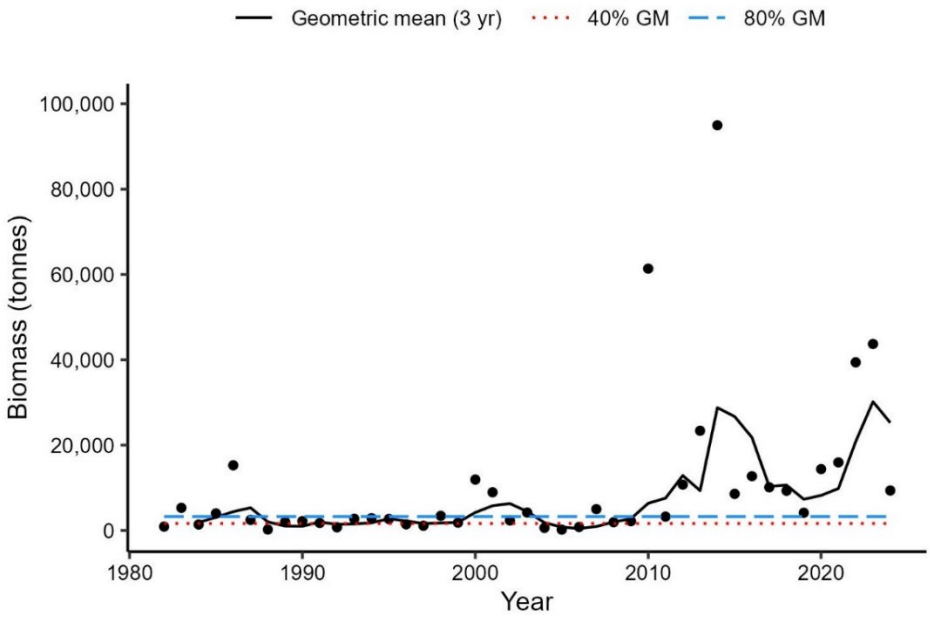

Figure 8d. Biomass index for Silver Hake in 4X west (strata 484–495) from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1982–2023), respectively. The black dots represent the biomass index for that year.

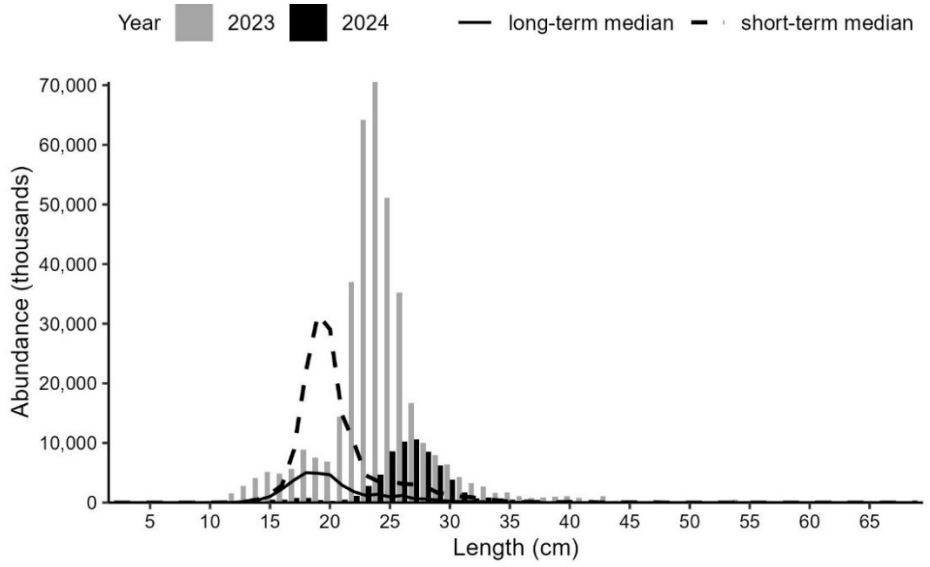

Figure 8e. Numbers-at-length (NAL) indices for Silver Hake in 4X west (strata 484–495) from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1982–2022. The dashed black line represents the median NAL for the time period 2013–2022.

Pollock

Pollock (*Pollachius virens*) catches were small throughout 4VWX with the majority (85%) not exceeding 10 kg (Figure 9a). The 2024 biomass index for the Western component (strata 474, 476, 480–495) is the second lowest of the time series and lowest since 1972, however, the 3-yr GM remains slightly above the 40% long-term GM (Figure 9b). Western component NAL indices were also predominantly below the long-term and short-term medians (Figure 9c). For the Eastern component (strata 440–473, 475, 477, 478), the biomass index increased to above the 40% long-term GM, however, the 3-yr GM remains below (Figure 9d). NAL indices are generally similar to or below the short-term and long-term medians for all lengths except those between 43 and 54 cm (Figure 9e).

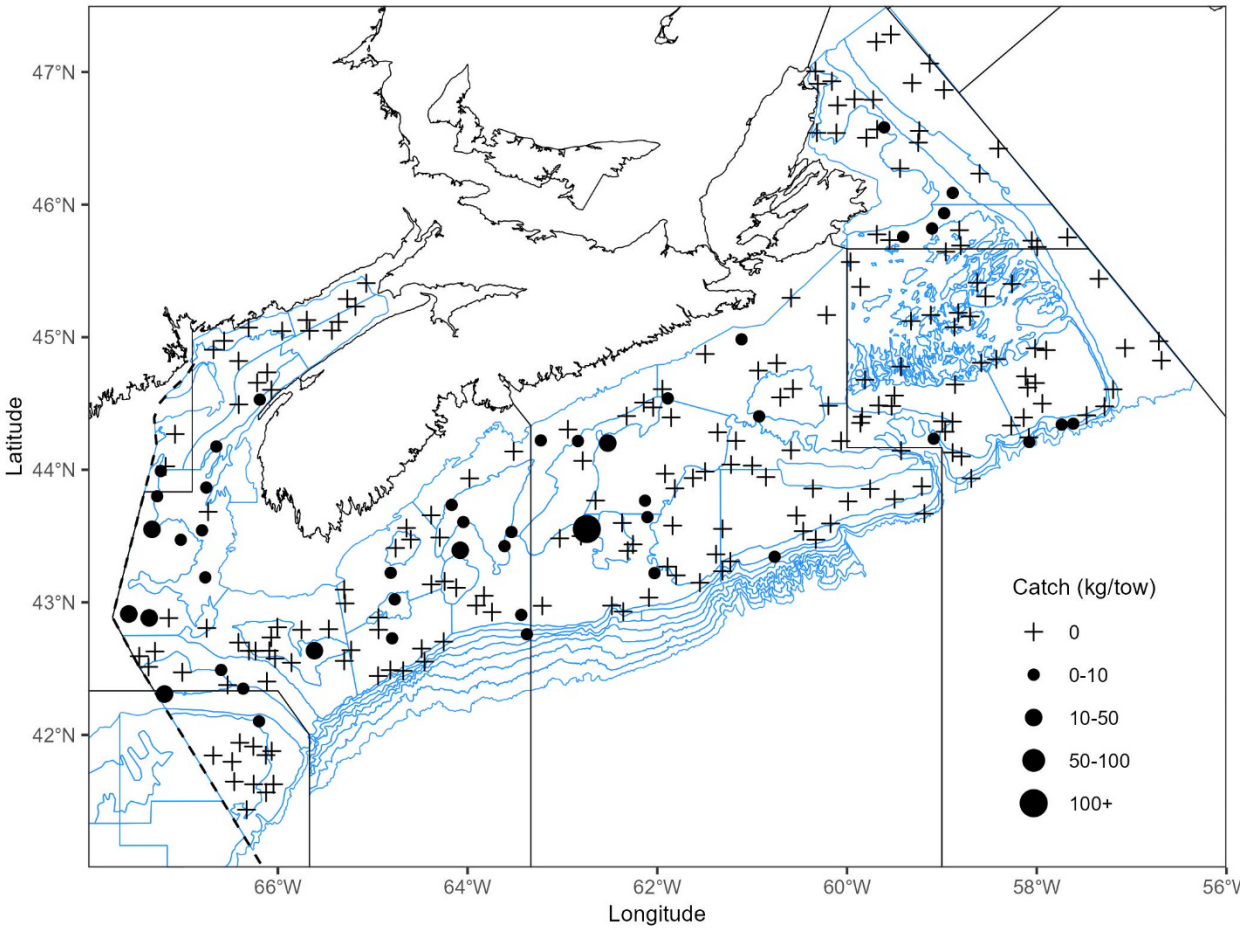

Figure 9a. Distribution of Pollock catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

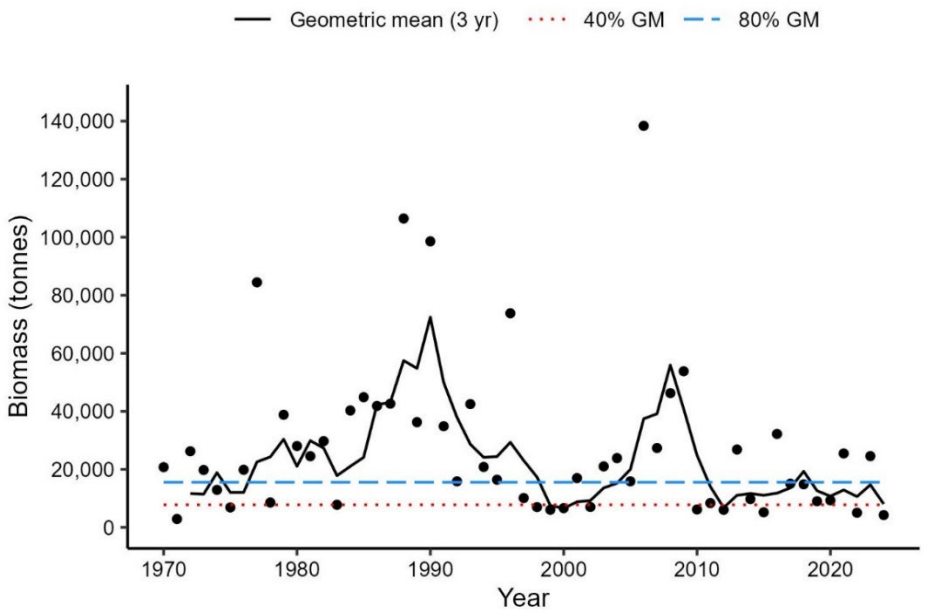

Figure 9b. Biomass index for Western component Pollock (strata 474, 476, 480–495) from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

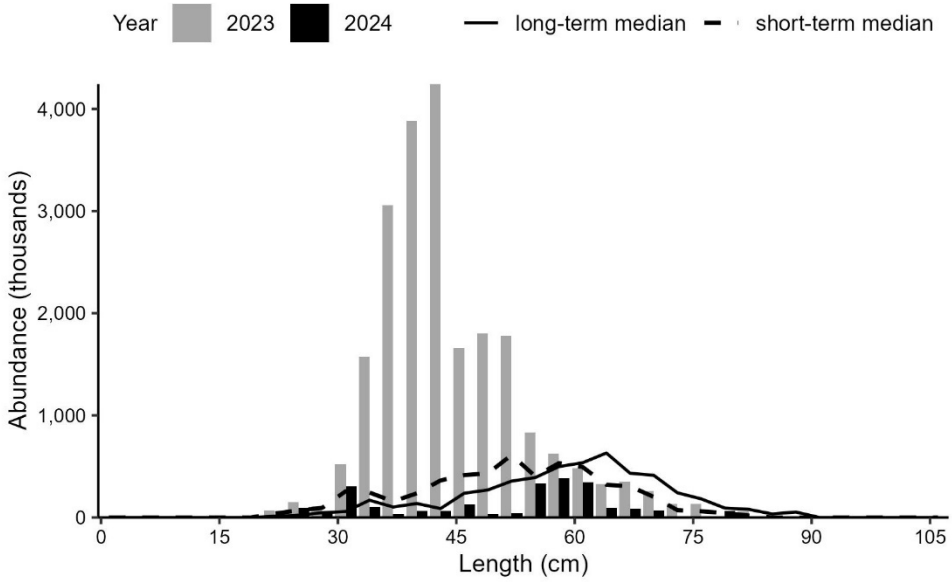

Figure 9c. Numbers-at-length (NAL) indices for Western component Pollock (strata 474, 476, 480–495) from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

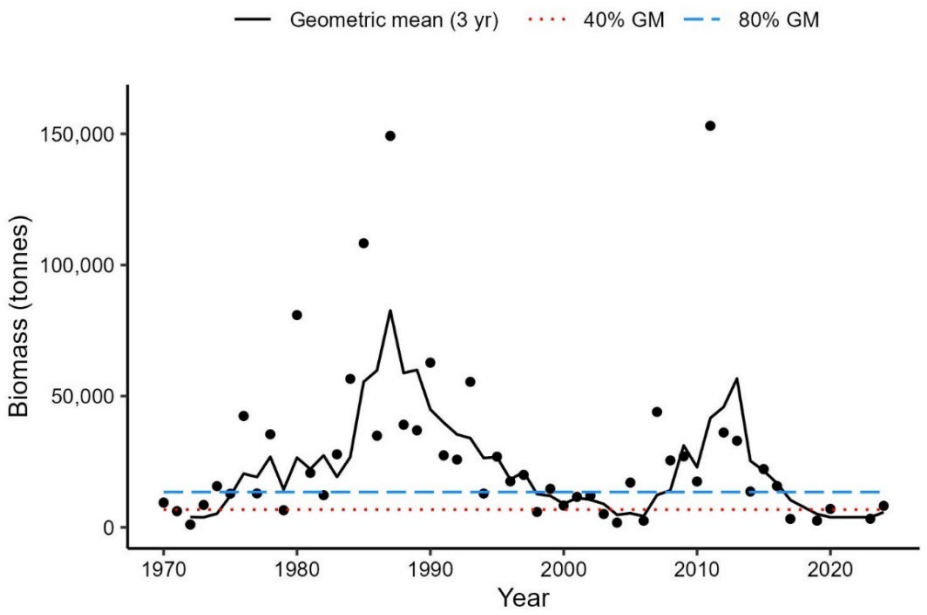

Figure 9d. Biomass index for Eastern component Pollock (strata 440–473, 475, 477, 478) from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

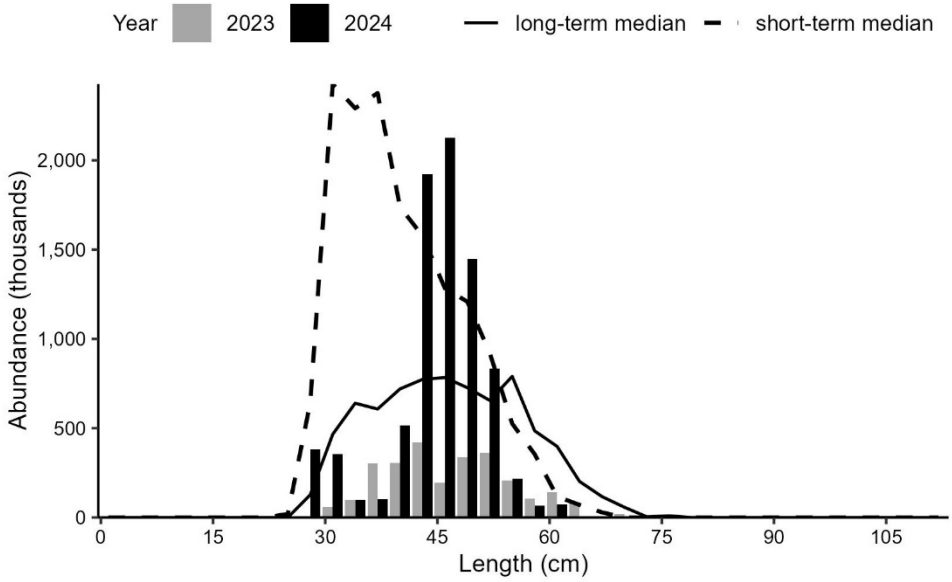

Figure 9e. Numbers-at-length (NAL) indices for the eastern component Pollock from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Redfish

A change in gear and vessel occurred in 1982, and a conversion factor was estimated for redfish (*Sebastes fasciatus* and *Sebastes mentella*) based on comparative fishing studies done at the time. However, due to small sample sizes and poorly distributed data, the conversion factor estimated for redfish was considered unreliable by the authors (Fanning 1985). It is expected that the gear used from 1970–1981 was less efficient at catching redfish compared to the gear used since 1982, and thus NAL indices and biomass are likely to be higher for the period of 1970–1981 if conversion factors were applied and compared to the remaining time series (1982–present). Rather than restrict the survey time series to 1982–2024, a vertical line is included in Figures 10b and 10d to indicate the change in gear and vessel, and pre-1982 indices should be interpreted with caution relative to the rest of the time series.

In previous reports, the 4VWefghj redfish area has been referred to as Unit II, however, the summer survey only covers a small portion of the actual Unit II stock area, thus the indices derived from the summer survey and reported here are not a true representation of the Unit II redfish stock. These data are available and can be included in Unit II redfish assessments but should not be used alone to assess the status of the Unit II redfish stock.

Redfish catches in 2024 were higher in 4V and 4X compared to 4W, with the largest catches observed within the Laurentian Channel (Figure 10a). The survey strata that include the deep waters of the Laurentian Channel were added in 2014 and are not currently used for the 4VWefghj (strata 440–455, 457) biomass and NAL estimates. The data are available for use in redfish assessments and should be included in indices once detailed analyses have been conducted. The biomass index and 3-yr GM for 4VWefghj redfish are both above the 80% long-term GM (Figure 10b). NAL indices for 4VWefghj redfish between 23 and 28 cm are above the short-term and long-term medians (Figure 10c), while indices for fish under 22 cm are well below both the short-term and long-term medians. For Unit III (strata 456, 458–495) redfish, the 2024 biomass index was above 80% of the long-term GM, however the 3-yr GM remained below 80% of the long-term GM (Figure 10d). NAL indices for Unit III redfish >20 cm are predominantly below the short-term and long-term medians, while indices for fish <21 cm are above the short-term and long-term medians (Figure 10e).

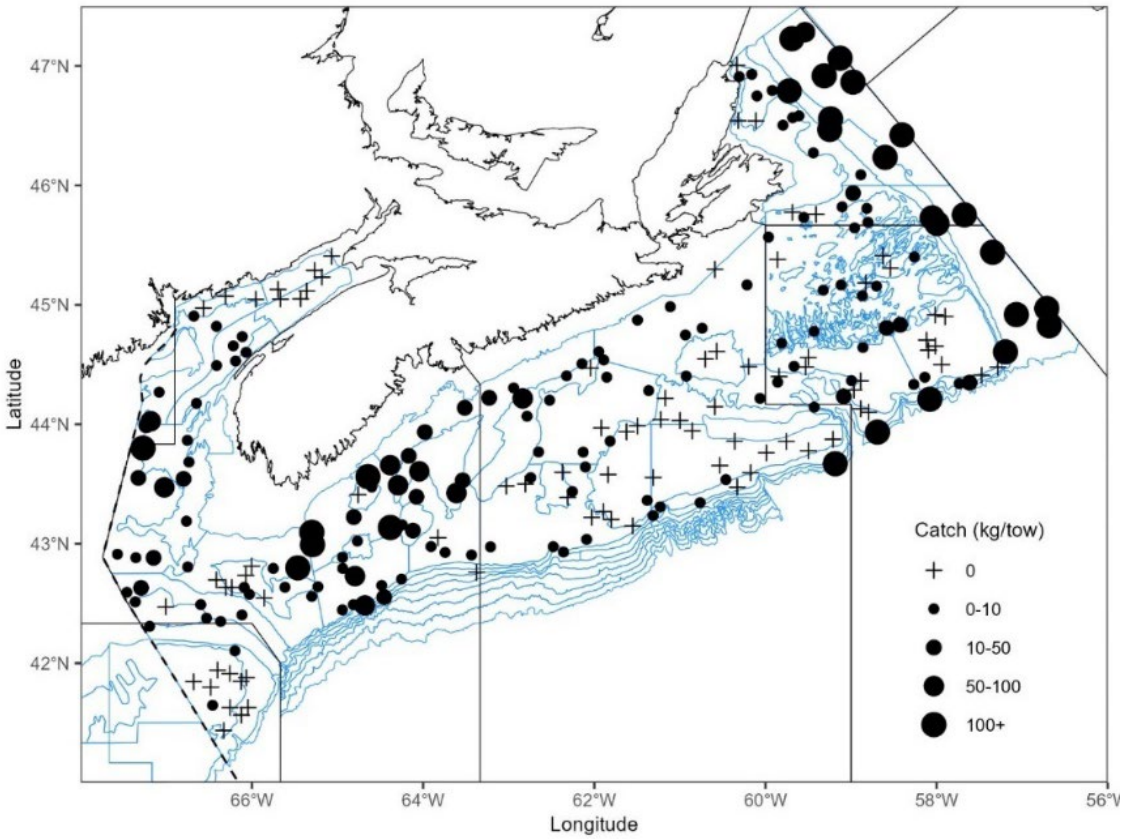

Figure 10a. Distribution of redfish catches during the 2024 Summer Ecosystem RV Survey including the Laurentian channel and Georges Bank. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

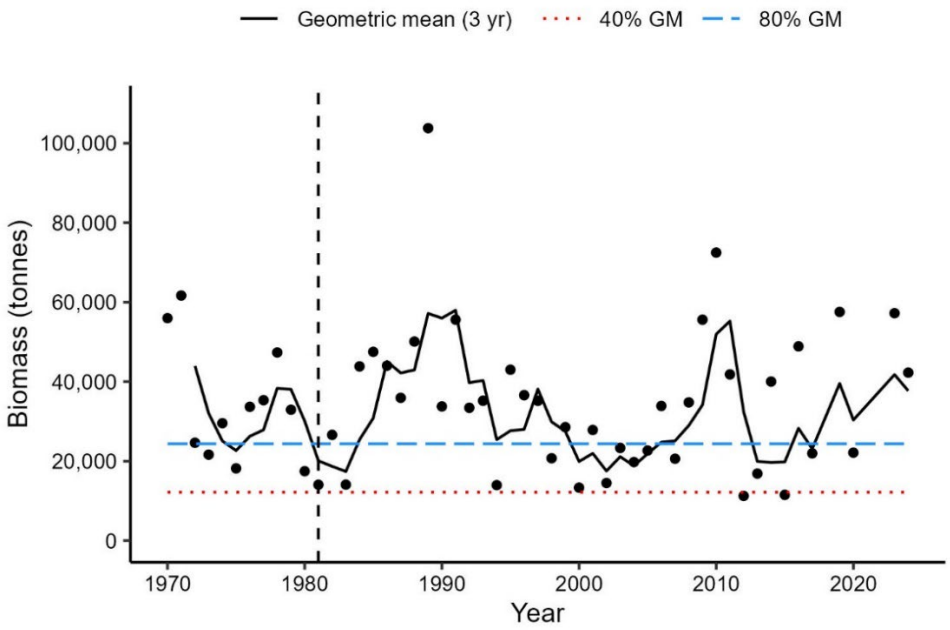

Figure 10b. Biomass index for 4VWefghj redfish (strata 440–456, 464) from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year. The vertical dashed line represents the final year before a change in vessel and gear occurred.

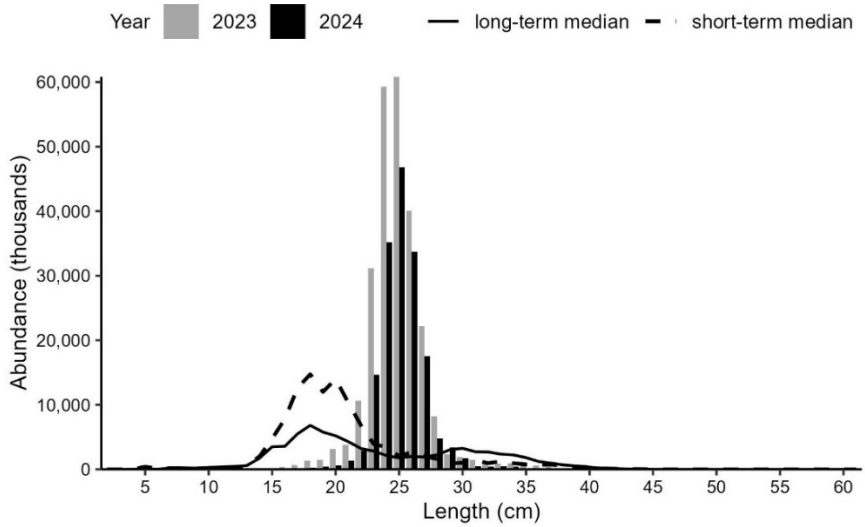

Figure 10c. Numbers-at-length (NAL) indices for 4VWefghj redfish (strata 440–456, 464) from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

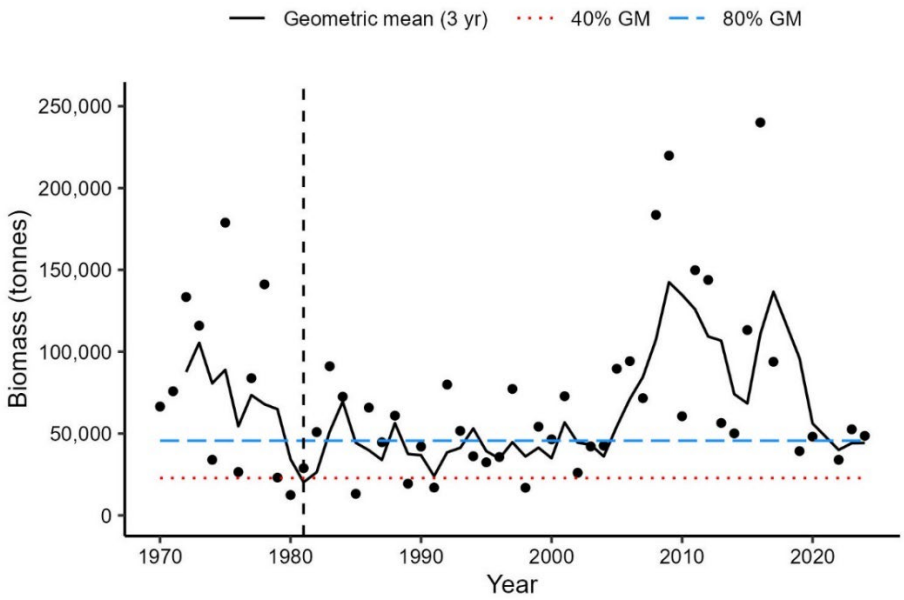

Figure 10d. Biomass index for Unit III redfish (strata 456, 458–495) from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year. The vertical dashed line represents the final year before a change in vessel and gear occurred.

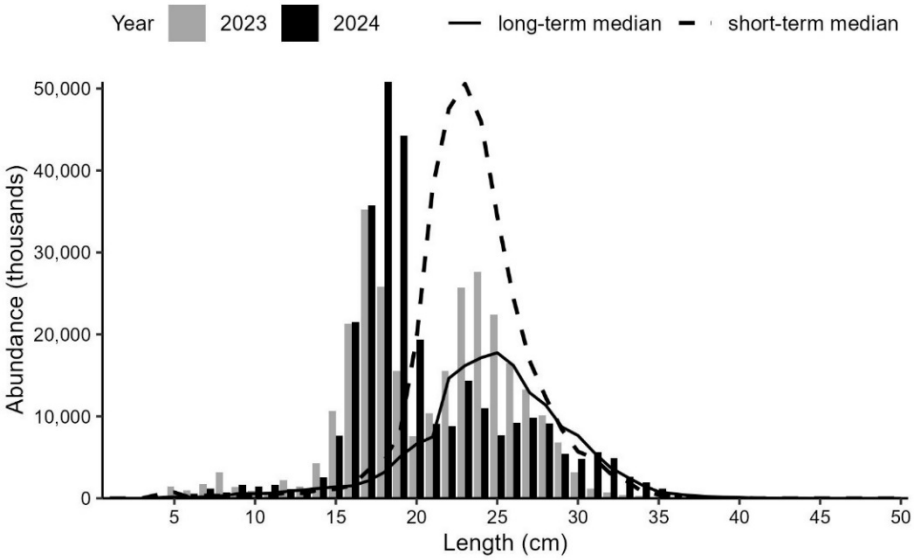

Figure 10e. Numbers-at-length (NAL) indices for Unit III redfish (strata 456, 458–495) from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2011–2022.

Atlantic Halibut

Atlantic Halibut (*Hippoglossus hippoglossus*) catches were widespread in the survey area with the highest catch occurring in 4Vs near the Gully Marine Protected Area which included a specimen weighing 124 kg (Figure 11a). The 2024 biomass index in 4VWX is among the highest observed in the time series and the 3-yr GM remains well above 80% of the long-term GM (Figure 11b). Since 2000, there has been a consistent increase in biomass throughout the area. In general, NAL indices for most lengths are at or above both the short-term and long-term medians (Figure 11c).

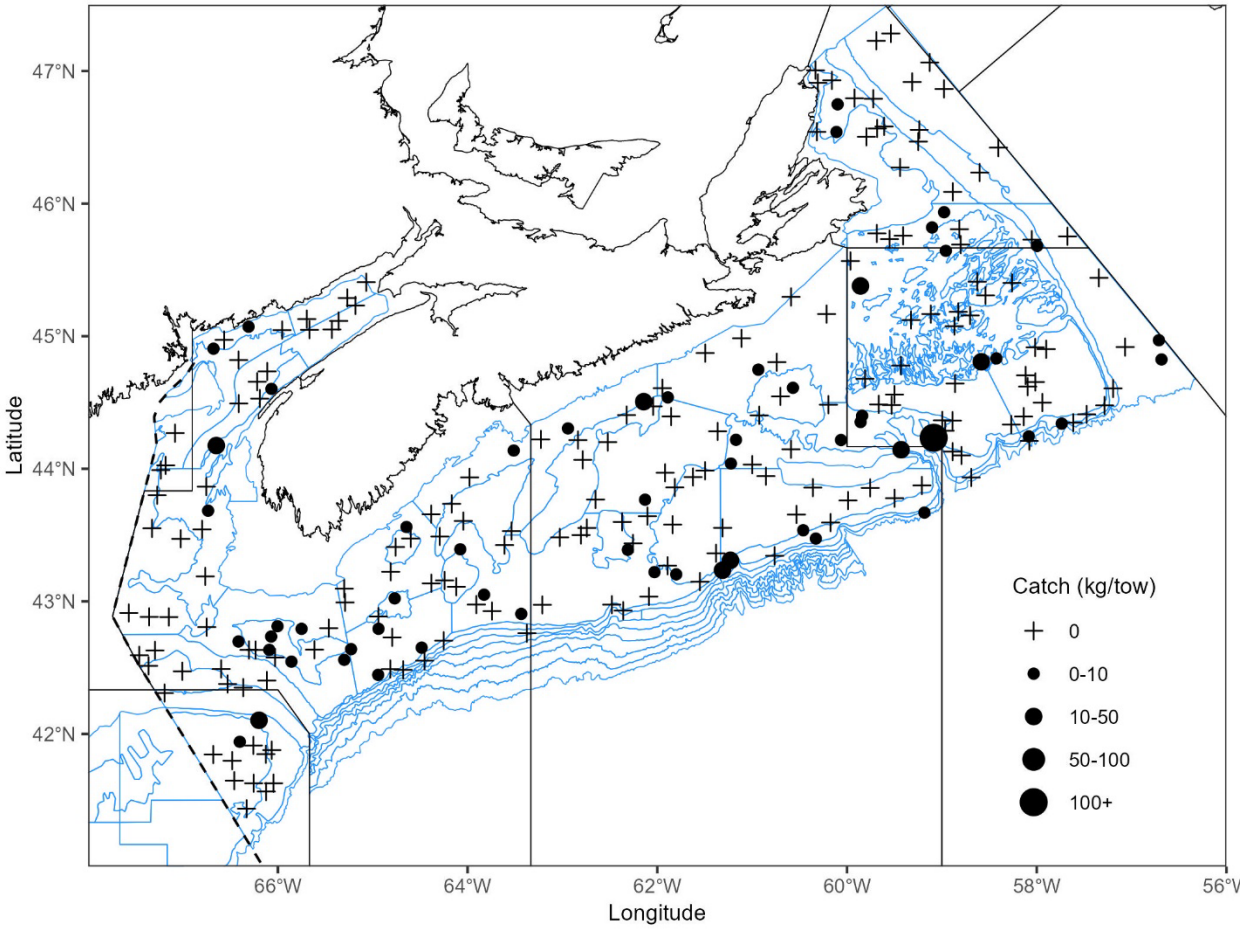

Figure 11a. Distribution of Atlantic Halibut catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

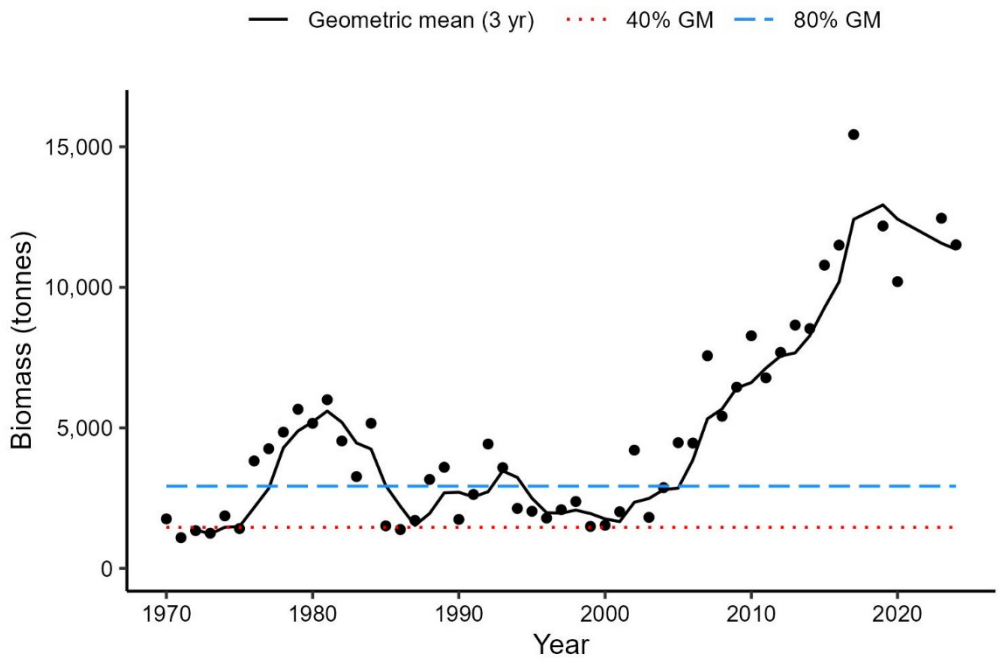

Figure 11b. Biomass index for Halibut in 4VWX from the Summer Ecosystem RV Survey. The 3-year geometric mean biomass is represented by the solid black line. The dashed blue and dotted red lines represent 80% and 40% of the long-term GM (1970–2023), respectively. The black dots represent the biomass estimate for that year.

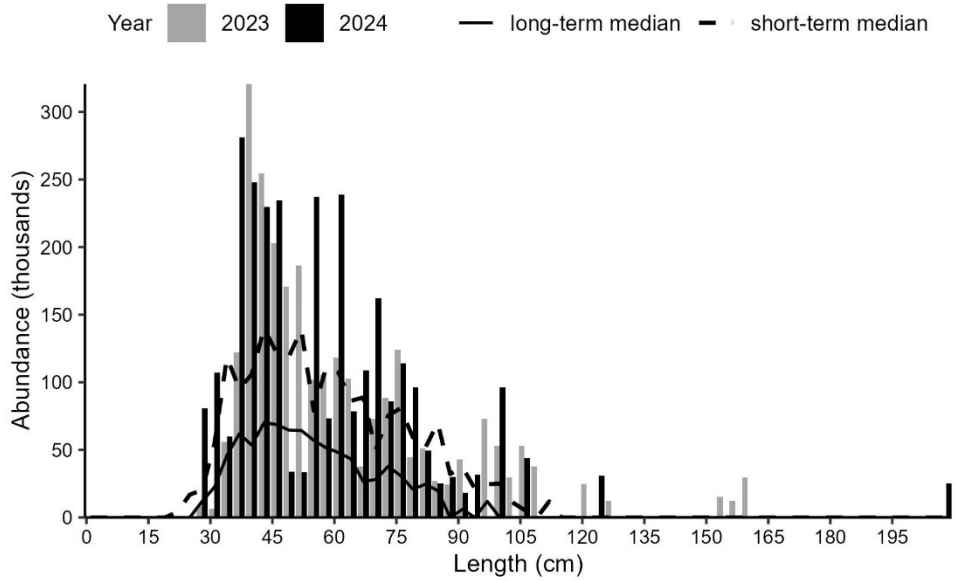

Figure 11c. Numbers-at-length (NAL) indices for Halibut in 4VWX from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Yellowtail Flounder

Yellowtail Flounder (*Limanda ferruginea*) were primarily caught in the south-east portions of 4VW (Figure 12a). In 4X, both the biomass index and the 3-yr GM in 2024 were below the 40% long-term GM (Figure 12b). The 2024 NAL indices for 4X are generally below the short-term median for fish less than 32 cm while fish above 32 cm are generally above (Figure 12c). The 2024 4VW biomass index and 3-yr GM remain in between the 40% and 80% long-term GM (Figure 12d). NAL indices in 2024 are similar to, or below, both the short-term and long-term medians (Figure 12e).

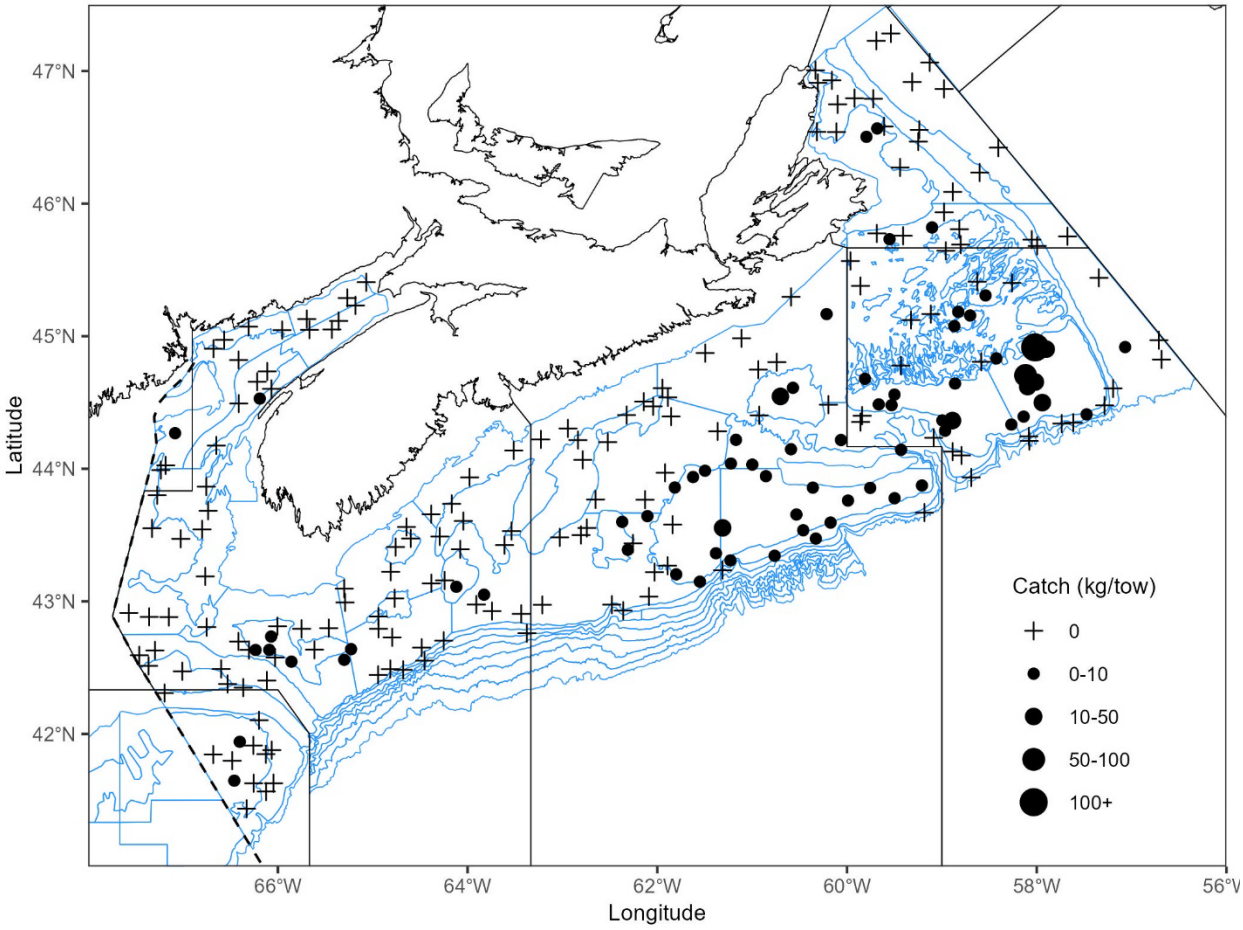

Figure 12a. Distribution of Yellowtail Flounder catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

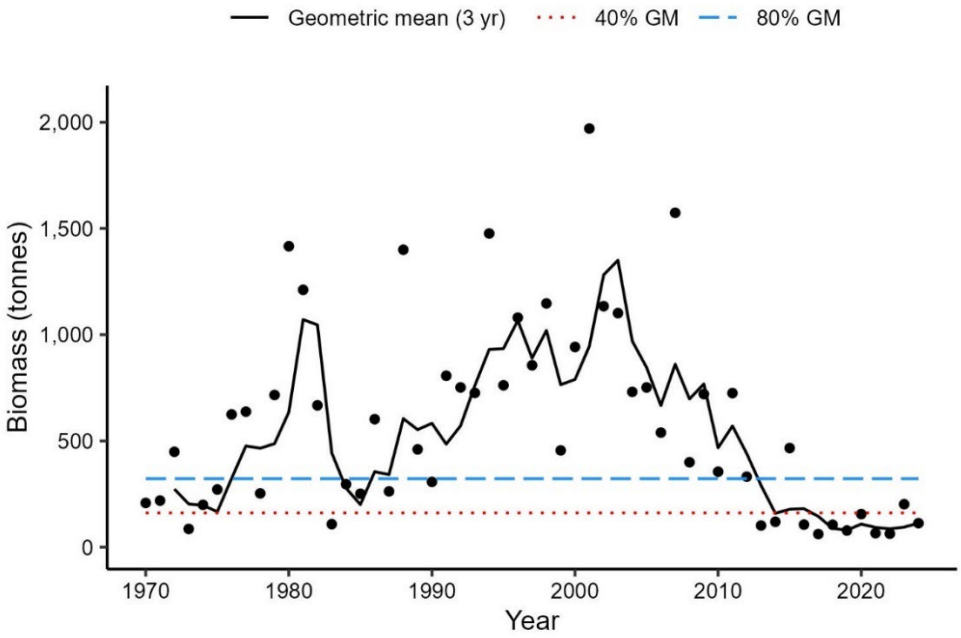

Figure 12b. Biomass index for Yellowtail Flounder in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

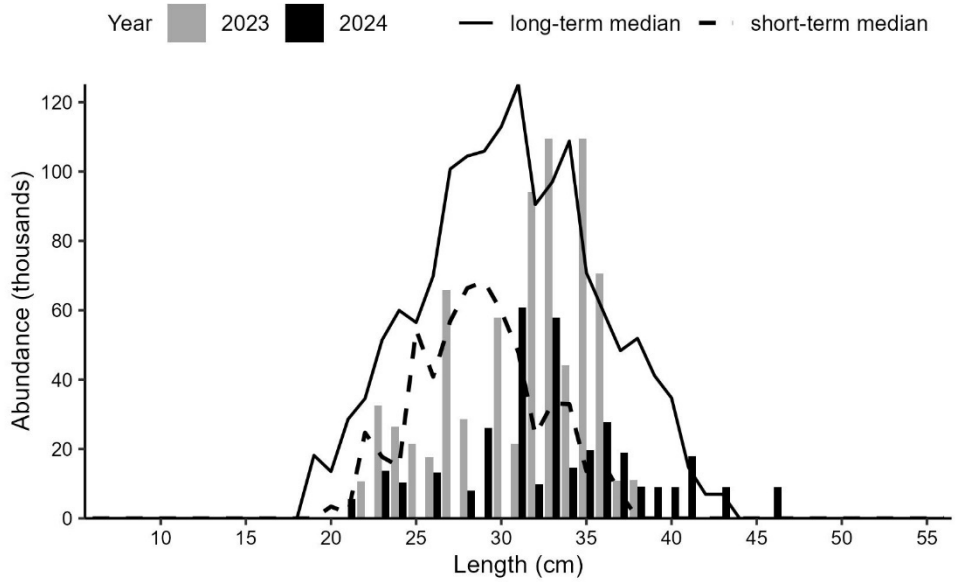

Figure 12c. Numbers-at-length (NAL) indices for Yellowtail Flounder in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

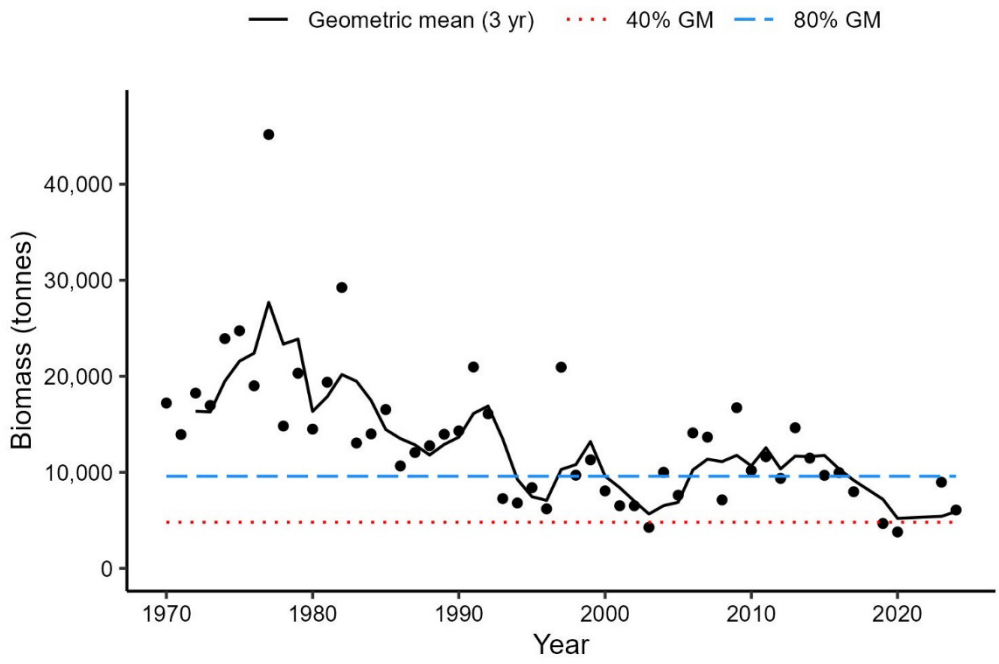

Figure 12d. Biomass index for Yellowtail Flounder in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

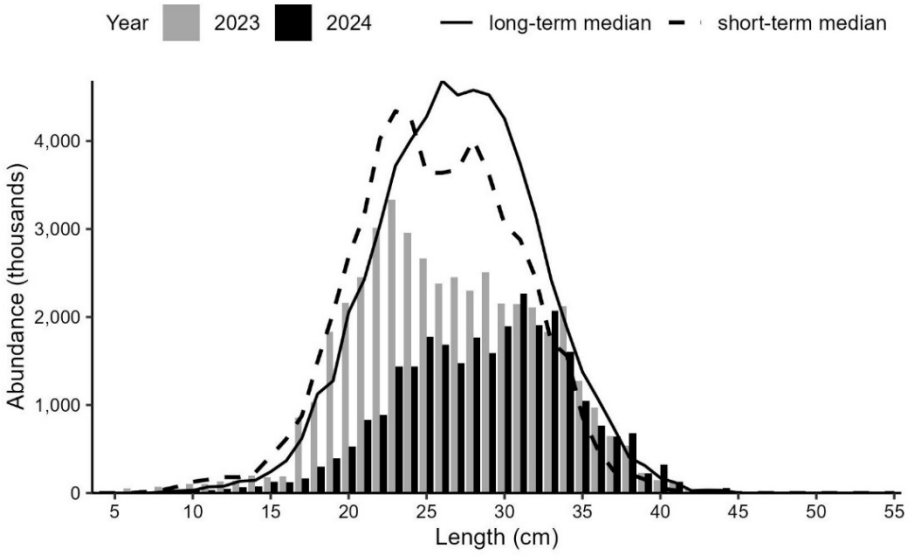

Figure 12e. Numbers-at-length (NAL) indices for Yellowtail Flounder in 4VW from the Summer Ecosystem RV Survey. Black bars represent the numbers-at-length from the 2024 survey. Grey bars represent the numbers-at-length from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

American Plaice

American Plaice (*Hippoglossoides platessoides*) catches were generally distributed across much of the survey range with larger catches observed in 4V (Figure 13a). In 4X, the biomass index and 3-yr GM remain low and neither has exceeded the 40% long-term GM since 2013 (Figure 13b). NAL indices in 2024 for 4X are generally similar to or below the short-term medians for most lengths, however, fish < 14 cm saw a notable increase indicating a positive sign of recruitment (Figure 13c). In 4VW, the biomass index is the lowest in the time series and the 3-yr GM remains below the 40% long-term GM since 2014 (Figure 13d). NAL indices in 4VW are generally below both the short-term and long-term medians for all lengths with the exception of fish <15 cm (Figure 13e).

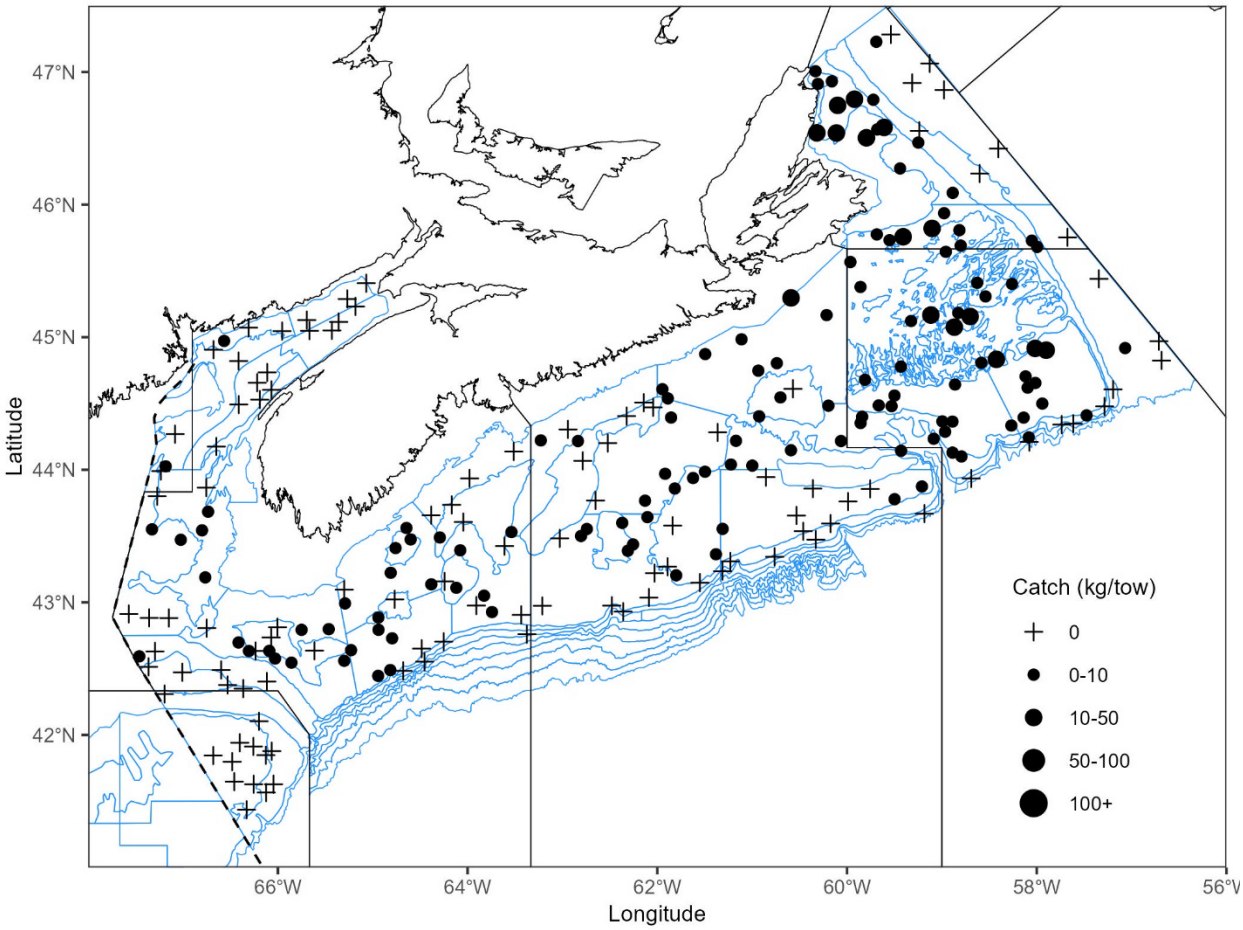

Figure 13a. Distribution of American Plaice catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

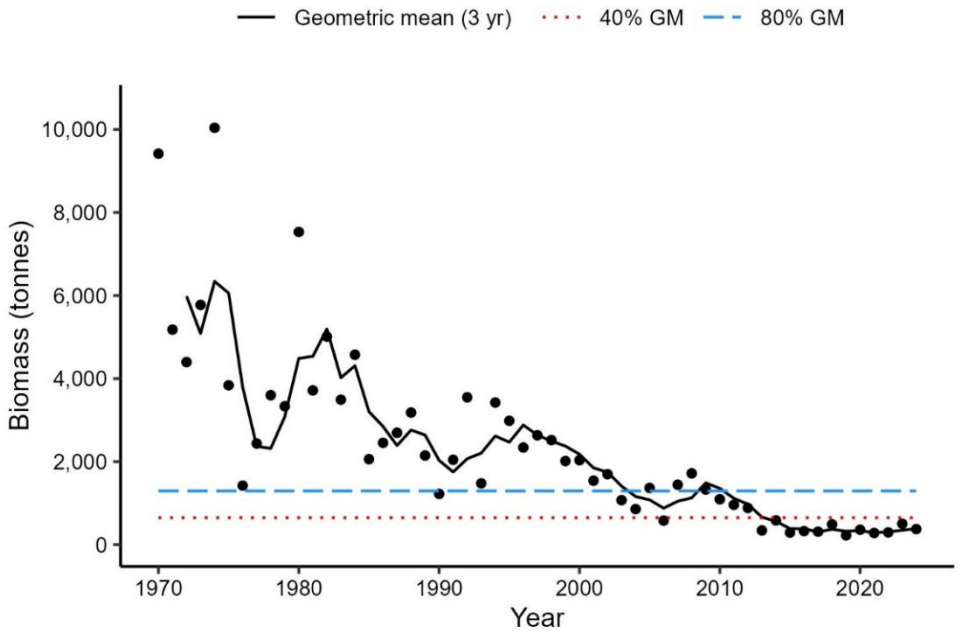

Figure 13b. Biomass index for American Plaice in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

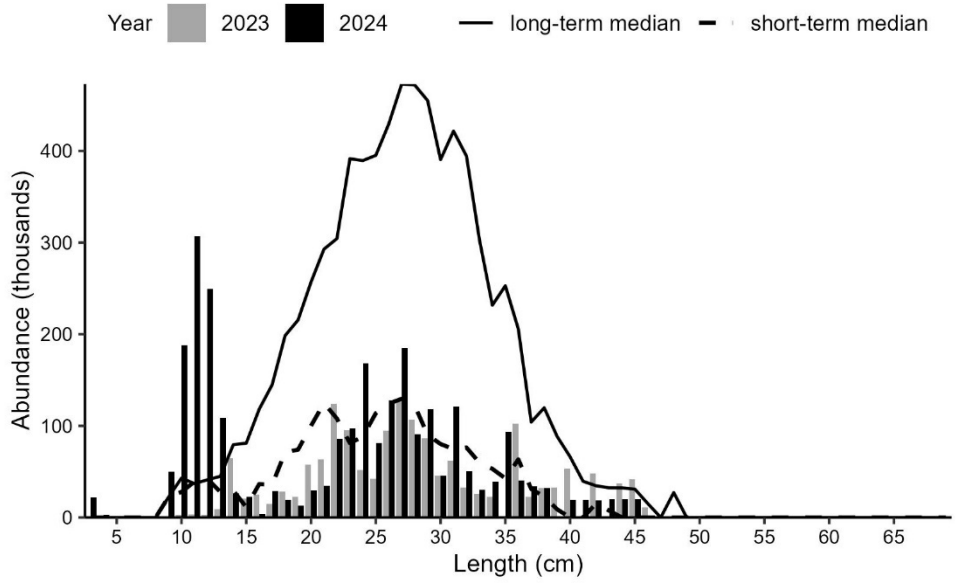

Figure 13c. Numbers-at-length (NAL) indices for American Plaice in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

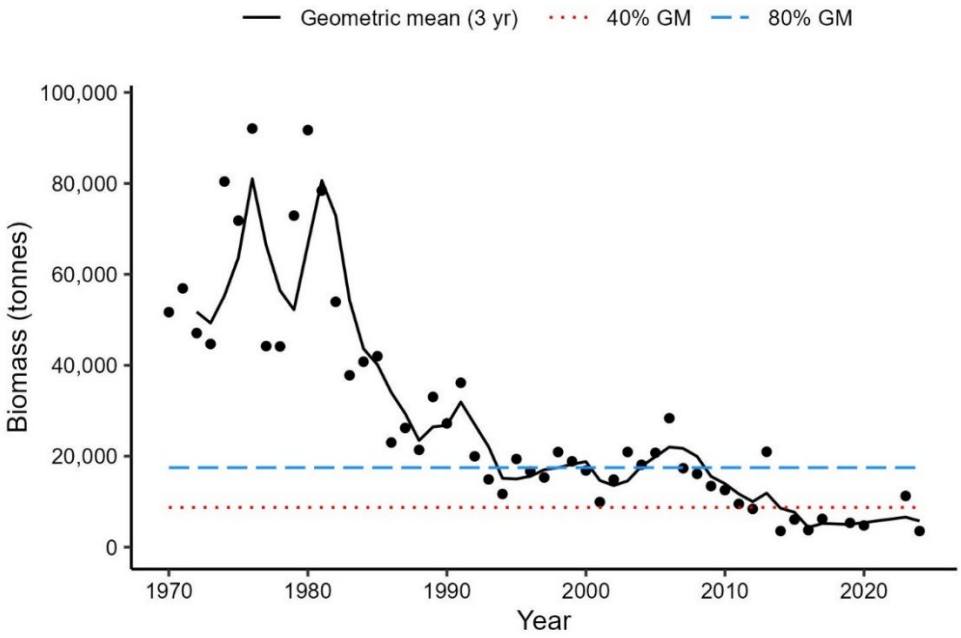

Figure 13d. Biomass index for American Plaice in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

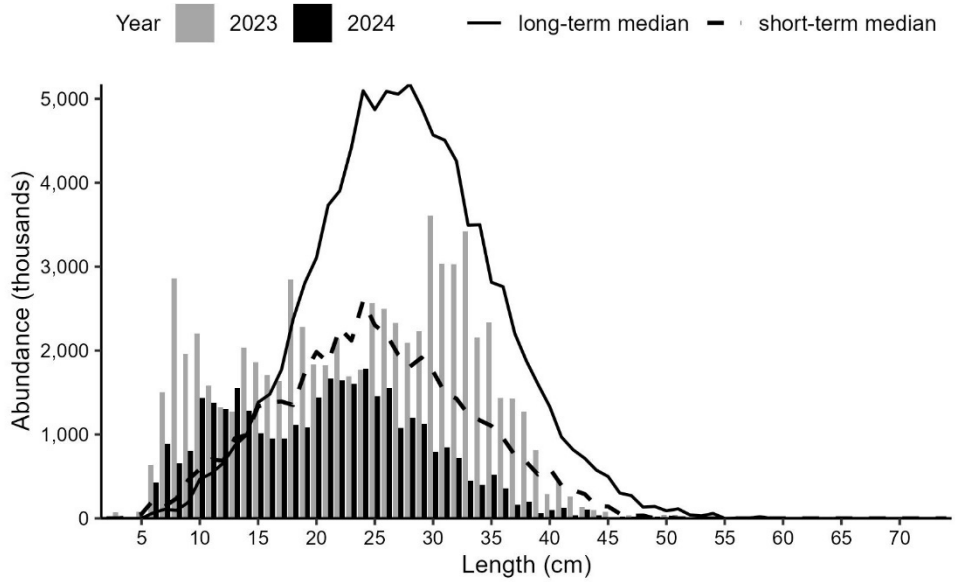

Figure 13e. Numbers-at-length (NAL) indices for American Plaice in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Witch Flounder

Witch Flounder (*Glyptocephalus cynoglossus*) catches were widespread throughout 4VWX (Figure 14a). The 2024 biomass index and 3-yr GM for 4X remain below the 80% long-term GM, but above the 40% long-term GM (Figure 14b). NAL indices in 4X are generally above or similar to the long-term median values, but below the short-term median at most lengths (Figure 14c). In 4VW, the 2024 biomass index decreased to its lowest point since 2016, however, it remains above the 80% long-term GM (Figure 14d). The 3-yr GM also remains well above the 80% long-term GM. NAL indices are generally above the long-term median for most lengths, but below the short-term median (Figure 14e). The short-term median NAL are generally higher than the long-term medians in both 4X and 4VW indicating a general increase in NAL of Witch Flounder across the Scotian Shelf.

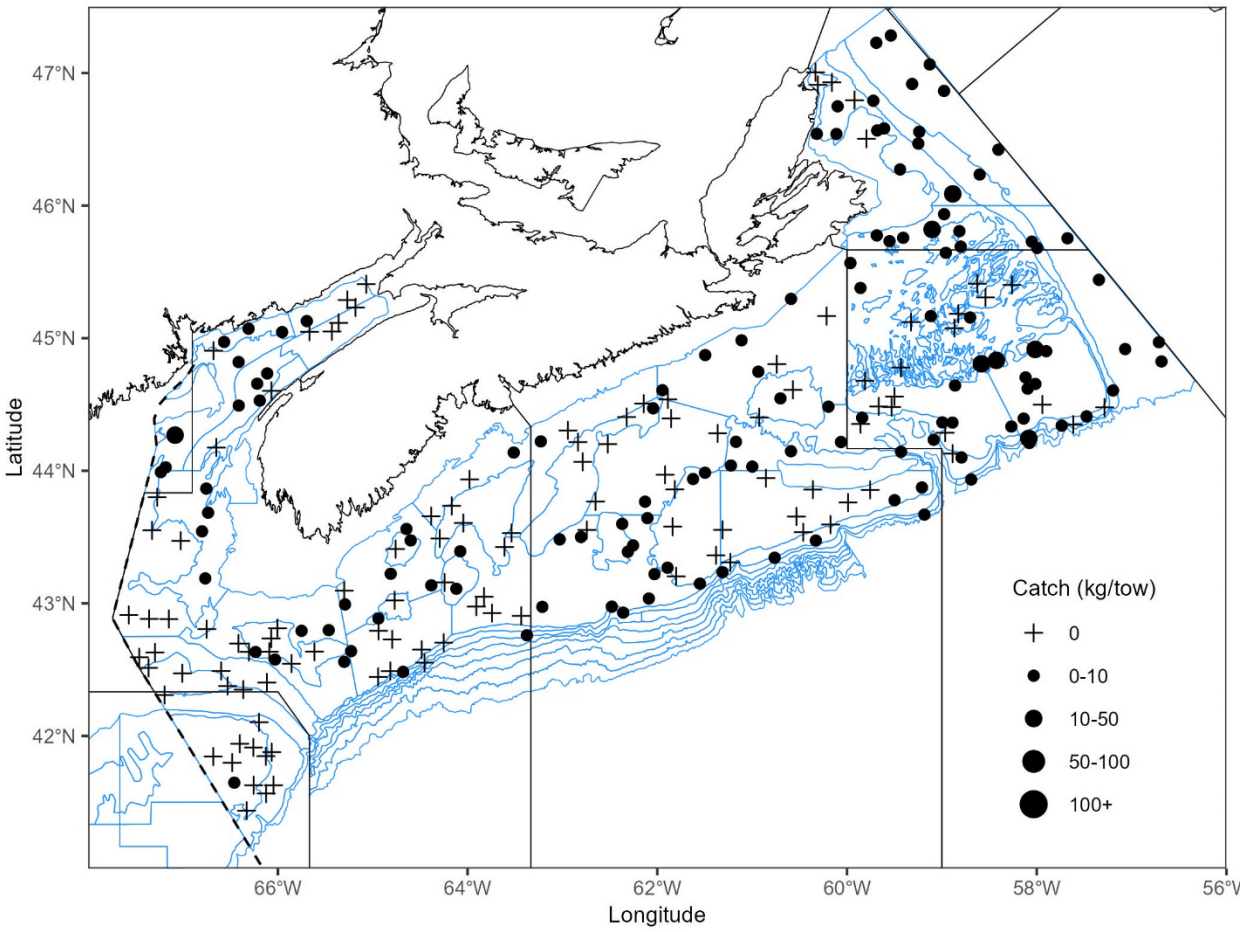

Figure 14a. Distribution of Witch Flounder catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

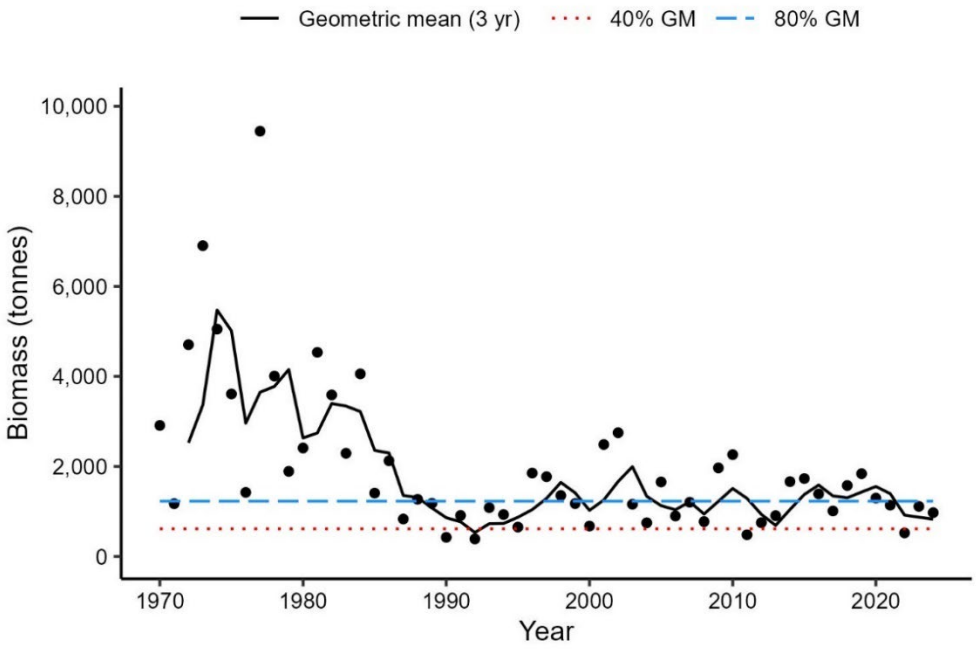

Figure 14b. Biomass index for Witch Flounder in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

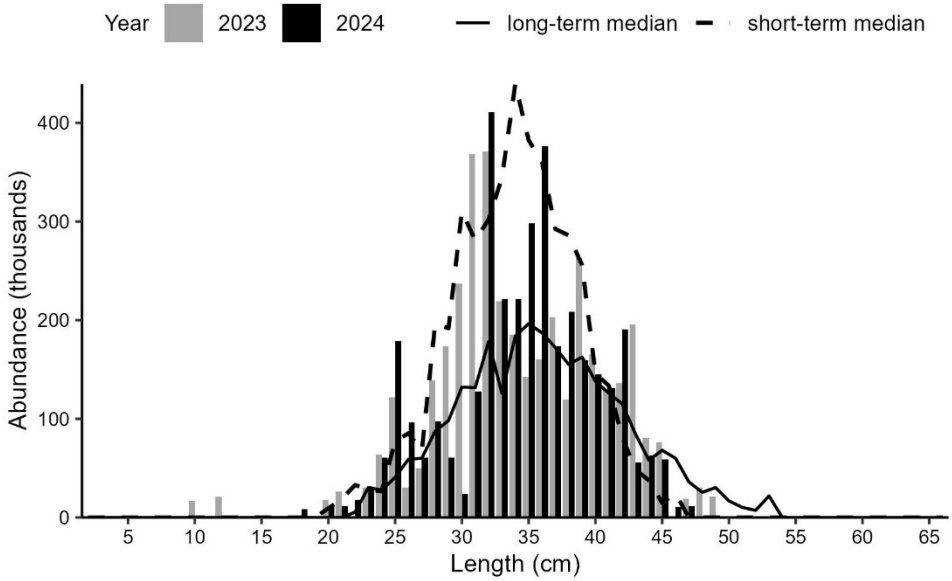

Figure 14c. Numbers-at-length (NAL) indices for Witch Flounder in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

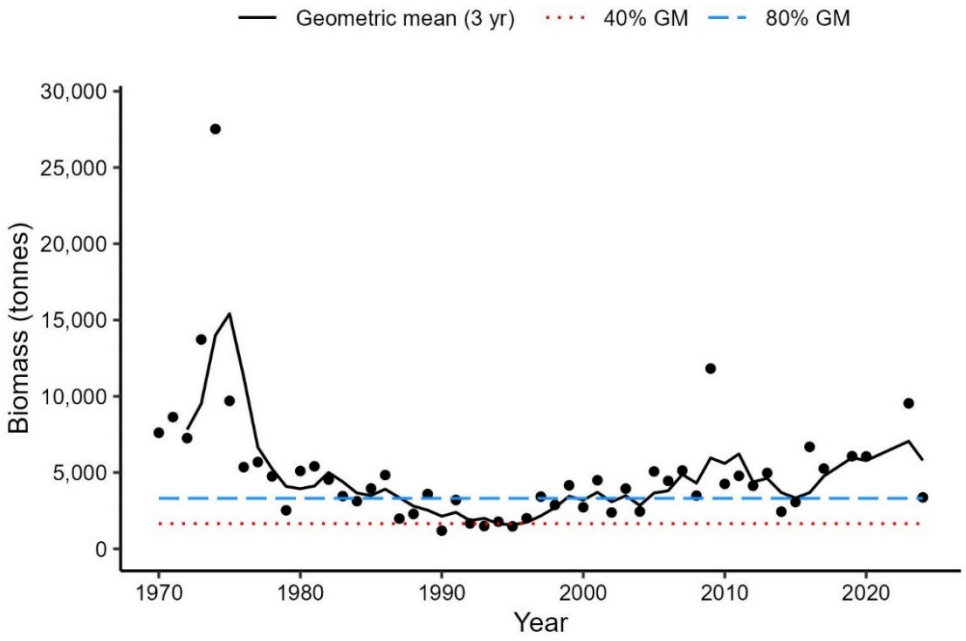

Figure 14d. Biomass index for Witch Flounder in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

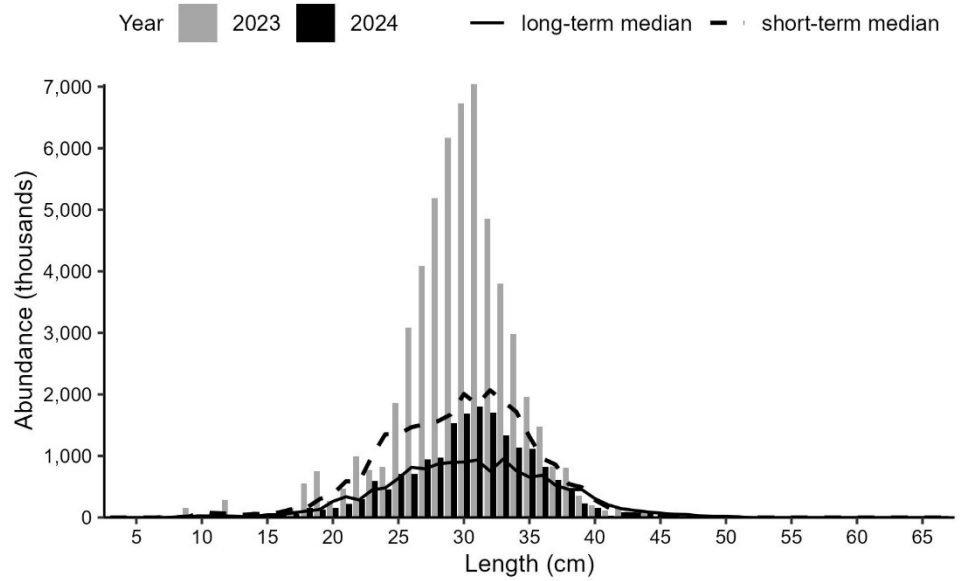

Figure 14e. Numbers-at-length (NAL) indices for Witch Flounder in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Winter Flounder

Winter Flounder (*Pseudopleuronectes americanus*) were caught primarily in 4X on Browns Bank and in the Bay of Fundy, with fewer catches occurring in 4W and no catches at all in 4V (Figure 15a). In 4X, the 2024 biomass index and 3-yr GM decreased from 2023 but remain well above the 80% long-term GM (Figure 15b). The 2024 NAL indices are below both the short-term and long-term medians with the exception of fish >34 cm which are similar to the median values (Figure 15c). The 4VW biomass index decreased below the 40% long-term GM for the first time since 2009 while the 3-yr GM remains just above the 40% long-term GM (Figure 15d). NAL indices for fish below 21 cm generally exceed the long-term median while remaining similar to the short-term median, while indices for fish above 23 cm are below the short-term and long-term medians (Figure 15e).

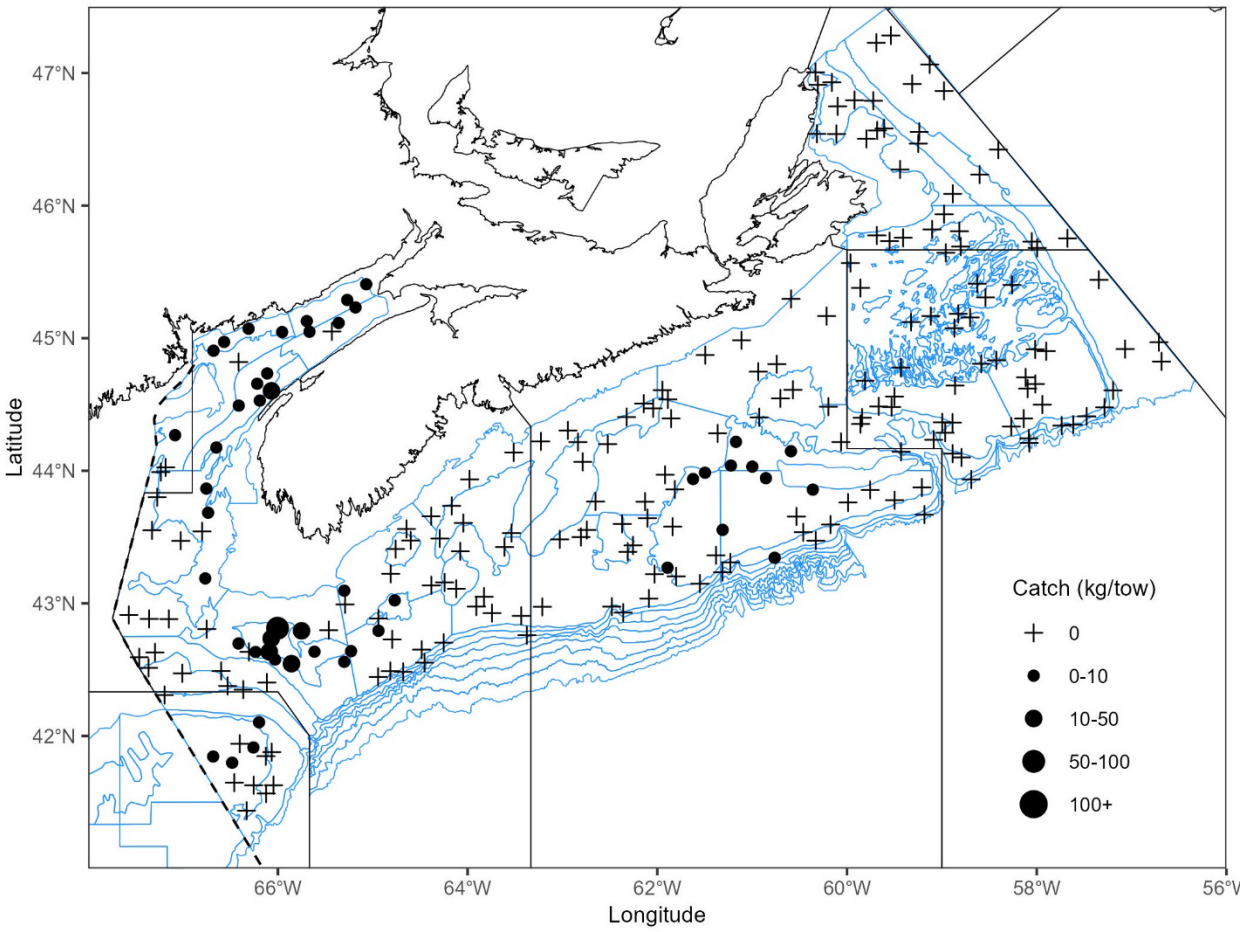

Figure 15a. Distribution of Winter Flounder catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

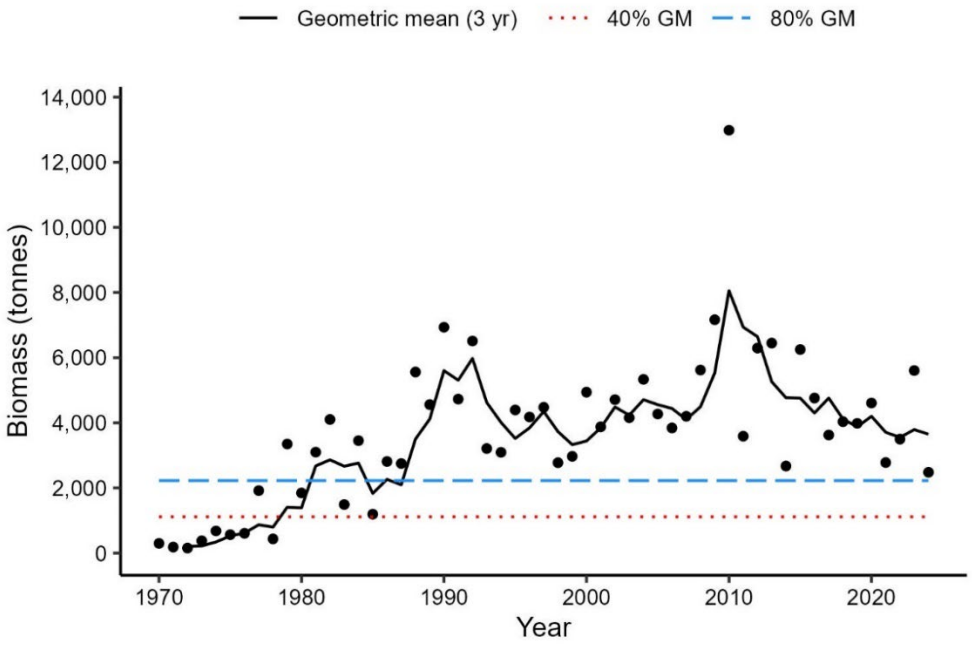

Figure 15b. Biomass index for Winter Flounder in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

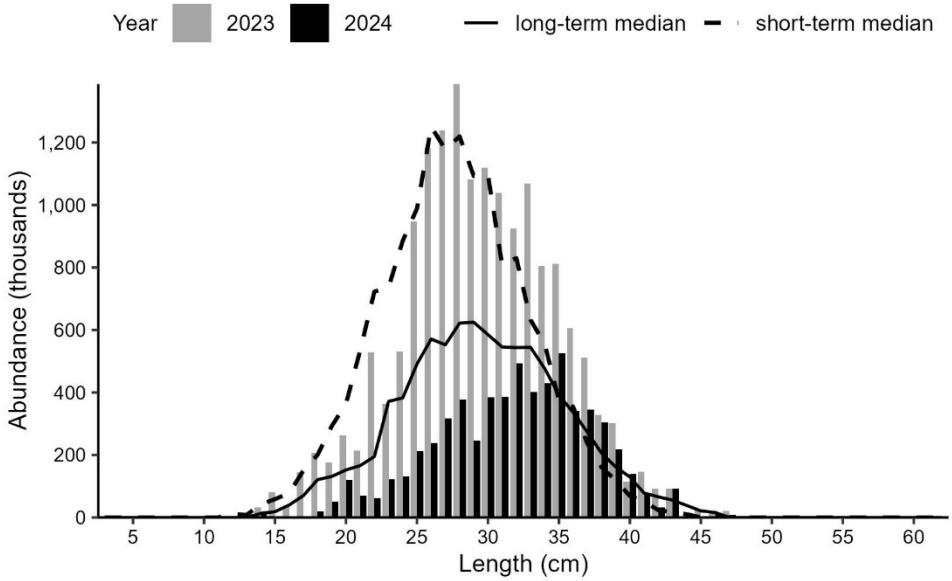

Figure 15c. Numbers-at-length (NAL) indices for Winter Flounder in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

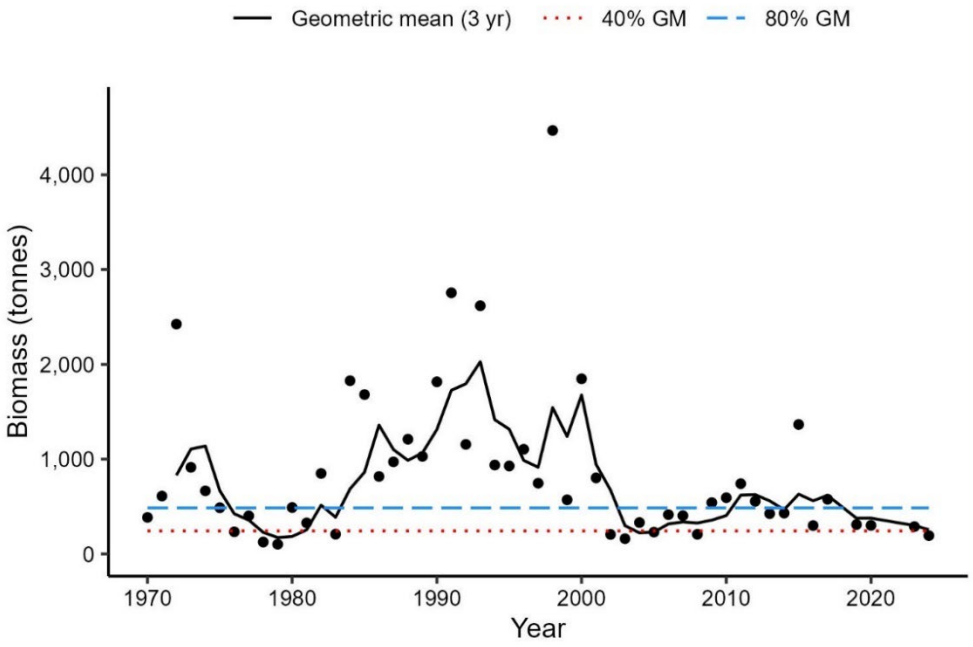

Figure 15d. Biomass index for Winter Flounder in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

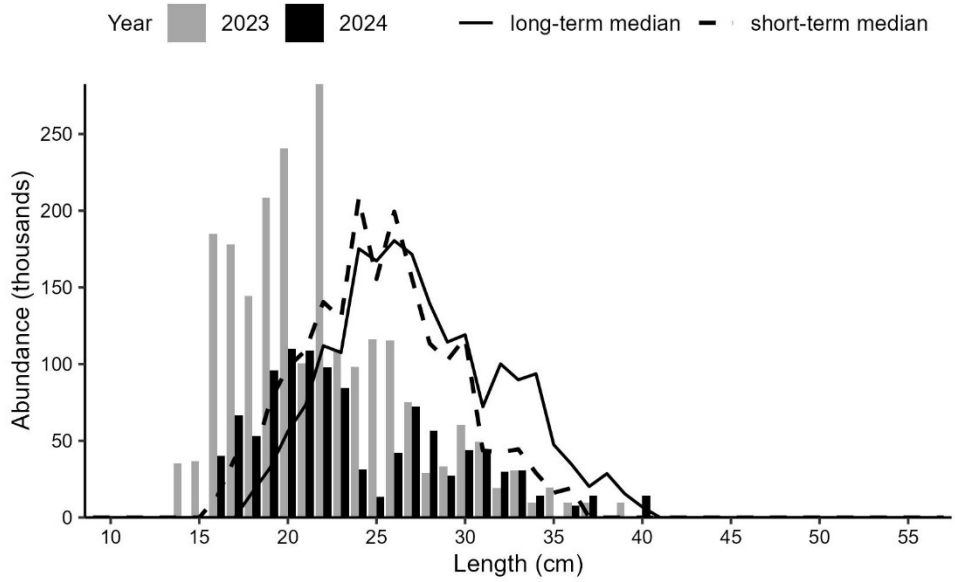

Figure 15e. Numbers-at-length (NAL) indices for Winter Flounder in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Atlantic Wolffish

Atlantic Wolffish (*Anarhichas lupus*) catches in 2024 predominantly occurred in 4V (Figure 16a). The 2024 biomass index and 3-yr GM for 4X remain below 40% of the long-term GM and have been since 2012 (Figure 16b). NAL indices for small fish are quite high in 2024, however, very few larger fish were observed (Figure 16c). In 4VW, the 3-yr GM in 2024 remains below the 40% long-term GM and has not exceeded this threshold since 2011 (Figure 16d). NAL indices for fish below 29 cm are generally above the long-term median, while fish above 29 cm tend to be below (Figure 16e).

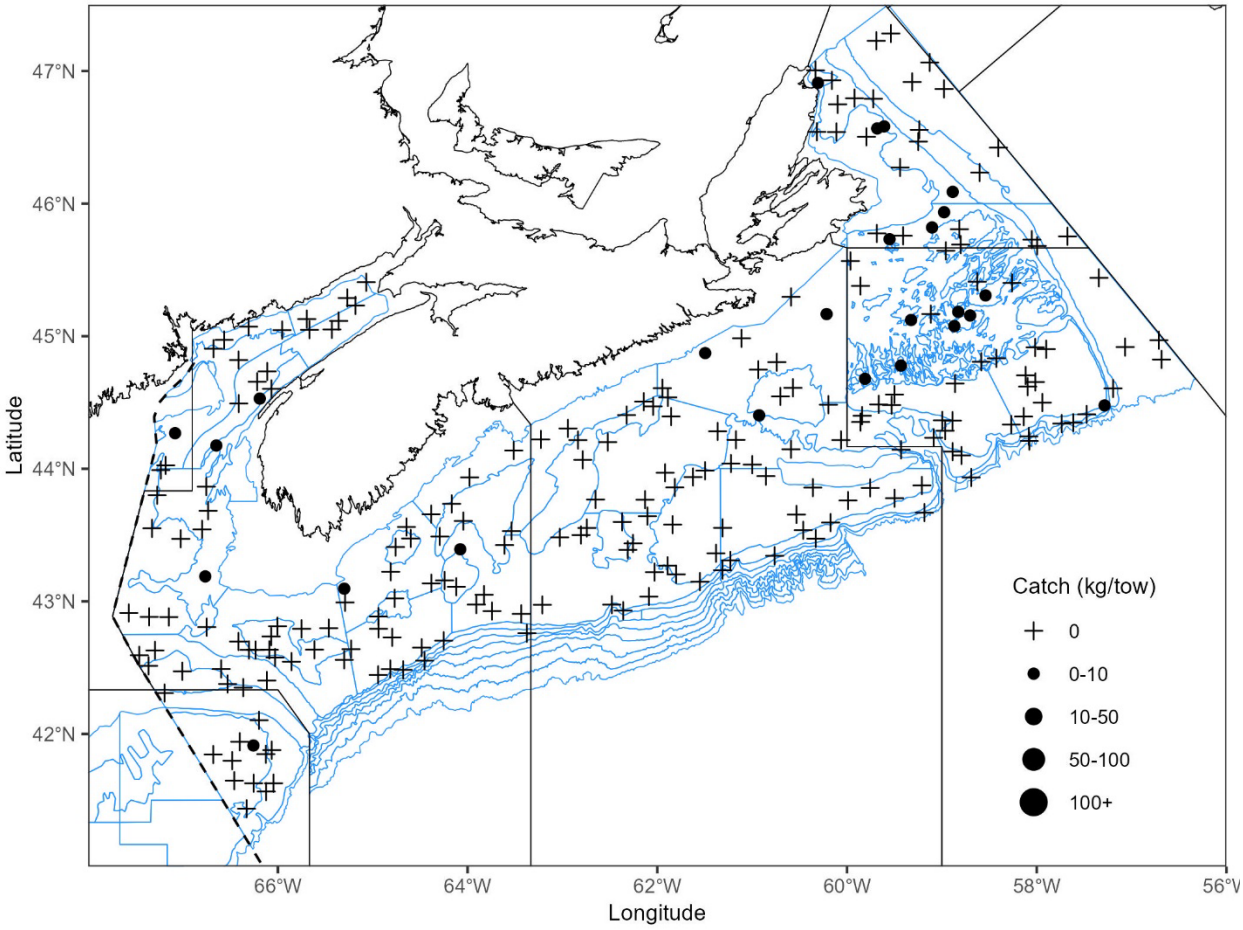

Figure 16a. Distribution of Atlantic Wolffish catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

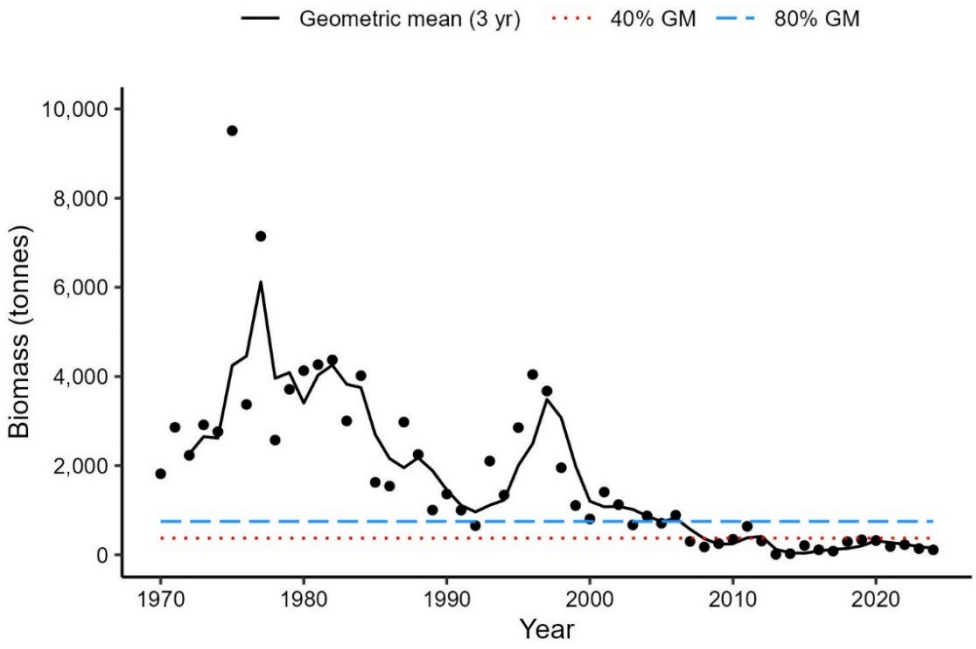

Figure 16b. Biomass index for Atlantic Wolffish in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

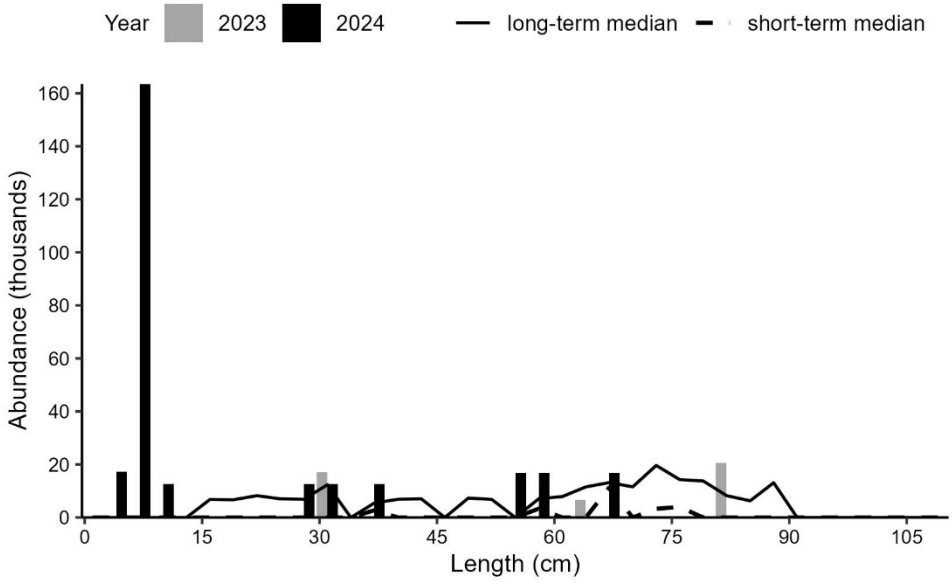

Figure 16c. Numbers-at-length (NAL) indices for Atlantic Wolffish in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

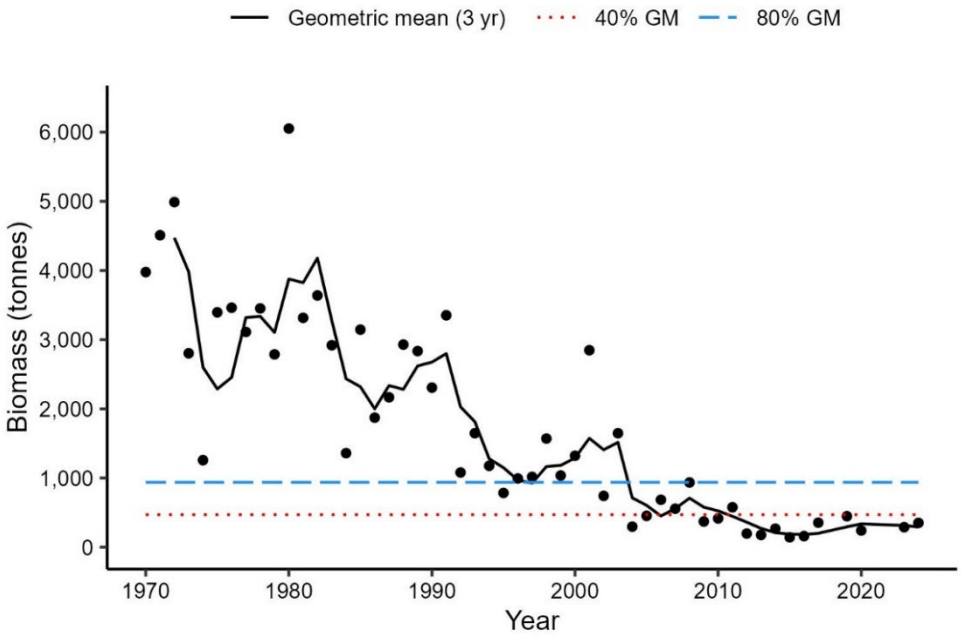

Figure 16d. Biomass index for Atlantic Wolffish in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

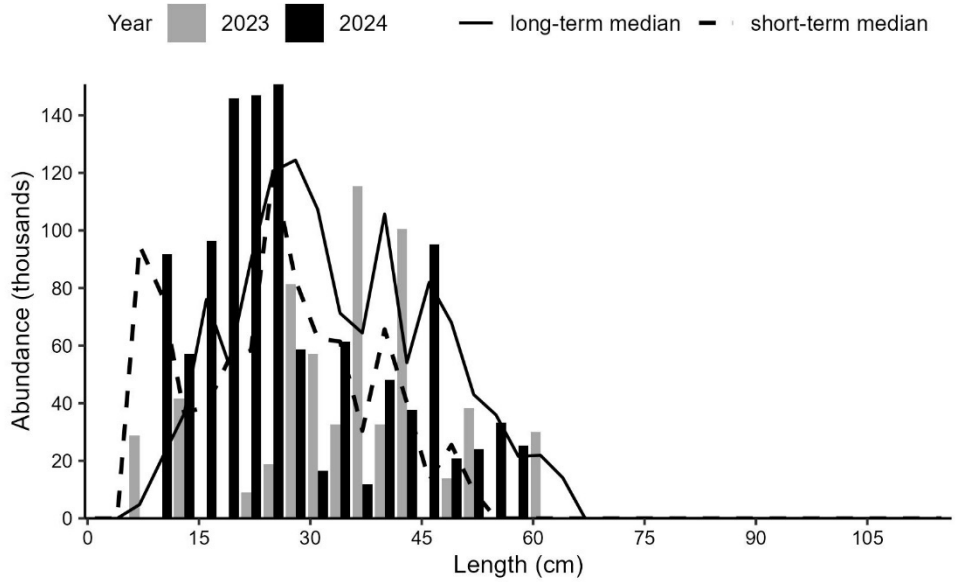

Figure 16e. Numbers-at-length (NAL) indices for Atlantic Wolffish in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Monkfish

Monkfish (*Lophius americanus*) catches predominantly occurred throughout 4X and 4W with fewer catches in 4V (Figure 17a). In 4X, both the biomass index and 3-yr GM remain above 80% of the long-term GM in 2024 (Figure 17b). The 2024 indices at length are generally above both the long-term and short-term medians for most lengths (Figure 17c). In 4VW, the biomass index and the 3-yr GM remain similar to recent years and are above the 40% long-term GM (Figure 17d). NAL indices for fish between 40 and 60 cm are generally above the short-term and long-term medians, with very few fish <30cm observed relative to the median values (Figure 17e).

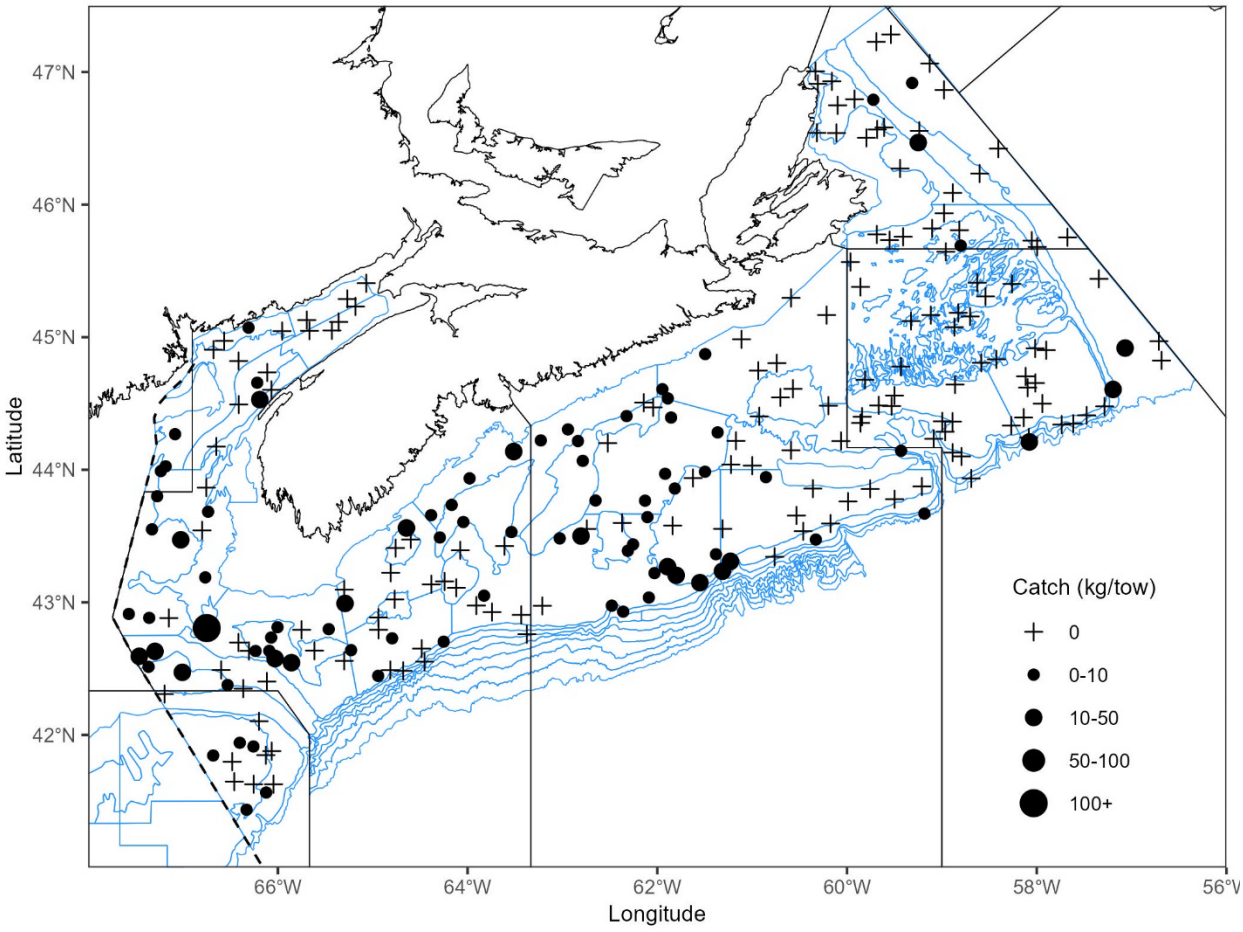

Figure 17a. Distribution of Monkfish catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

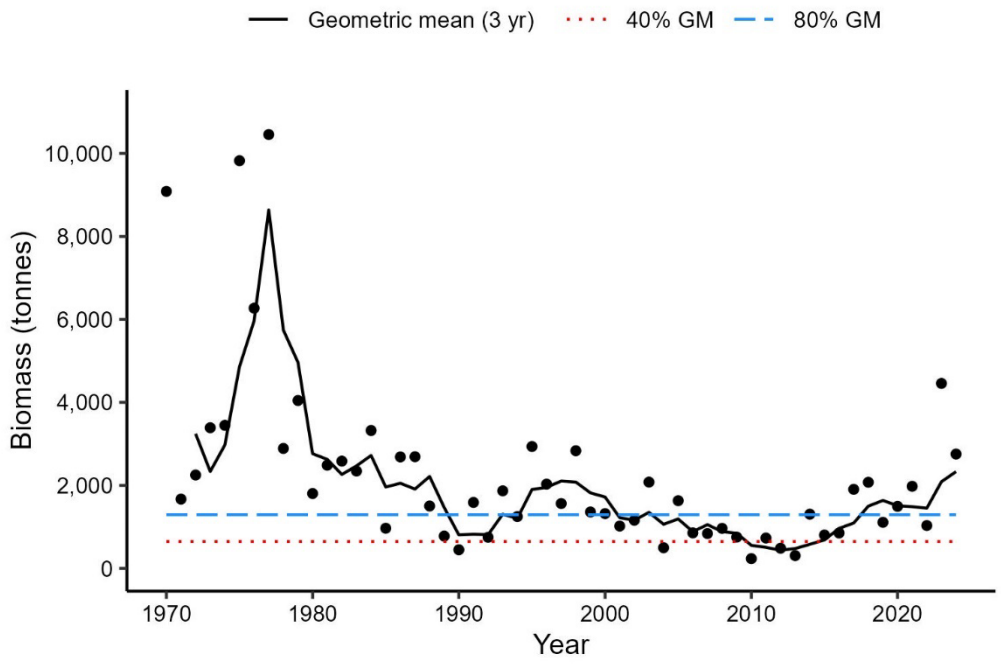

Figure 17b. Biomass index for Monkfish in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

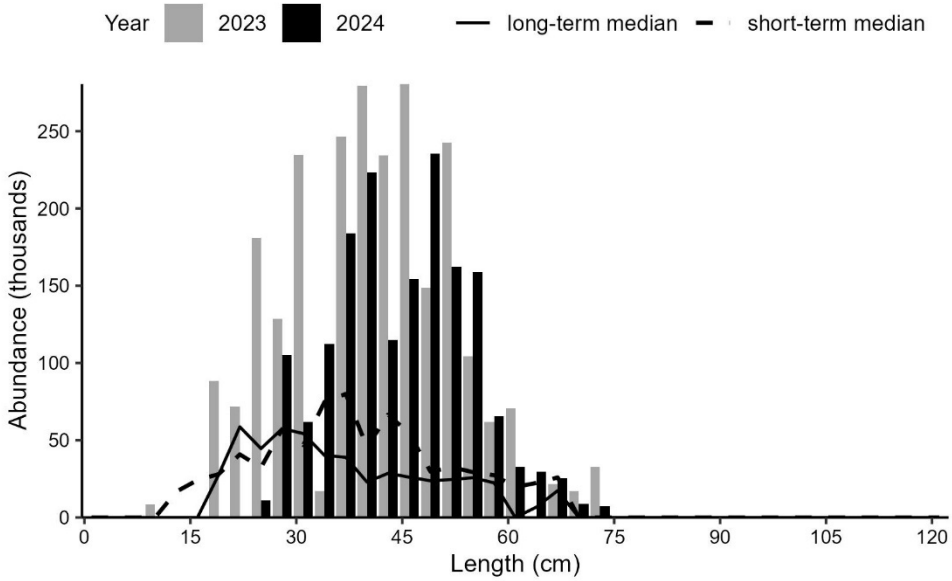

Figure 17c. Numbers-at-length (NAL) indices for Monkfish in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

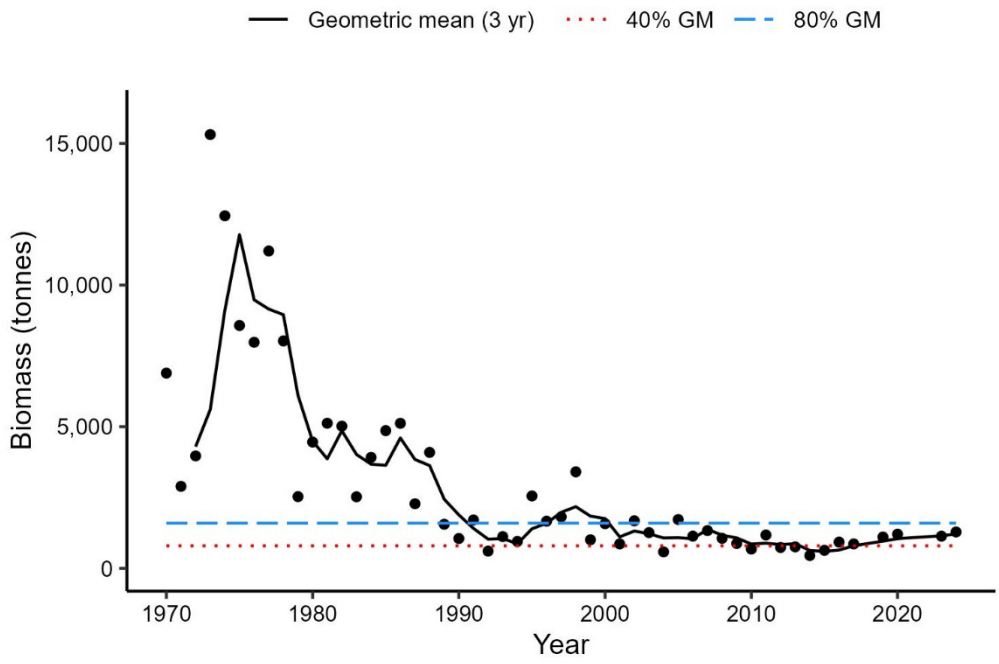

Figure 17d. Biomass index for Monkfish in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

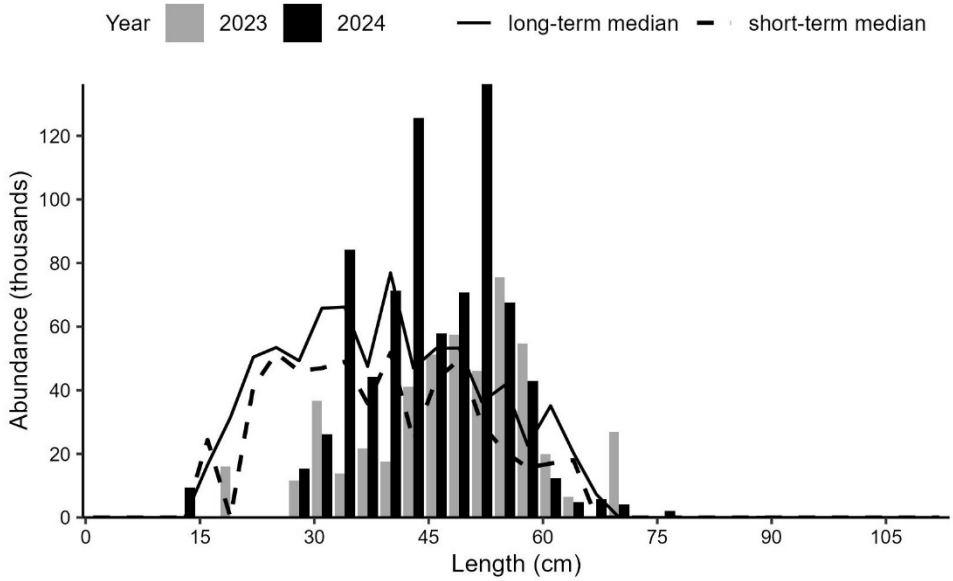

Figure 17e. Numbers-at-length (NAL) indices for Monkfish in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Longhorn Sculpin

Longhorn Sculpin (*Myoxocephalus octodecemspinosus*) are generally caught on the banks of the Scotian Shelf and in the Bay of Fundy (Figure 18a). In 4X, the 2024 biomass index and 3-yr GM remain above 80% of the long-term mean (Figure 18b). In 4X, NAL indices surrounding the mode of 24 cm are above the short-term and long-term medians while most other lengths are generally similar to the short-term and long-term medians (Figure 18c). In 4VW, the 2024 biomass index decreased significantly from 2023 to the lowest point in the time series and is below the 40% long-term GM for the first time since 1980, while the 3-yr GM is below the 80% long-term GM (Figure 18d). NAL indices for all lengths are well below both the short-term and long-term medians (Figure 18e).

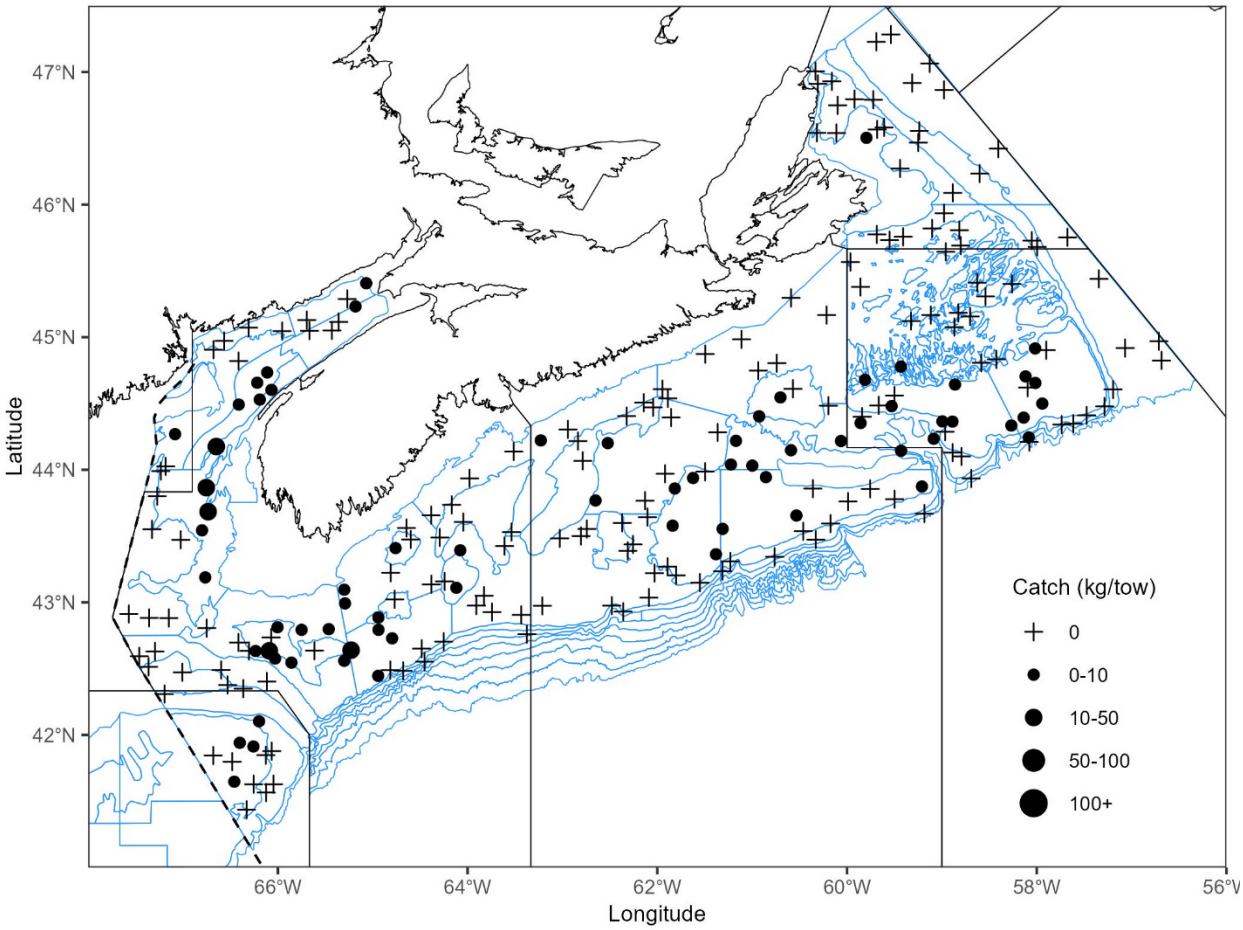

Figure 18a. Distribution of Longhorn Sculpin catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

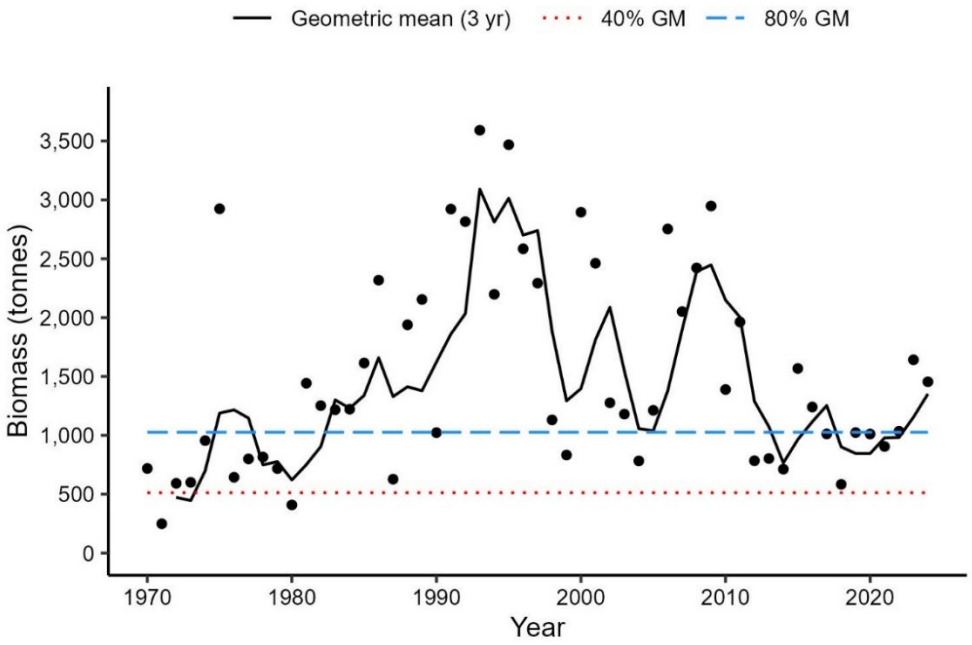

Figure 18b. Biomass index for Longhorn Sculpin in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

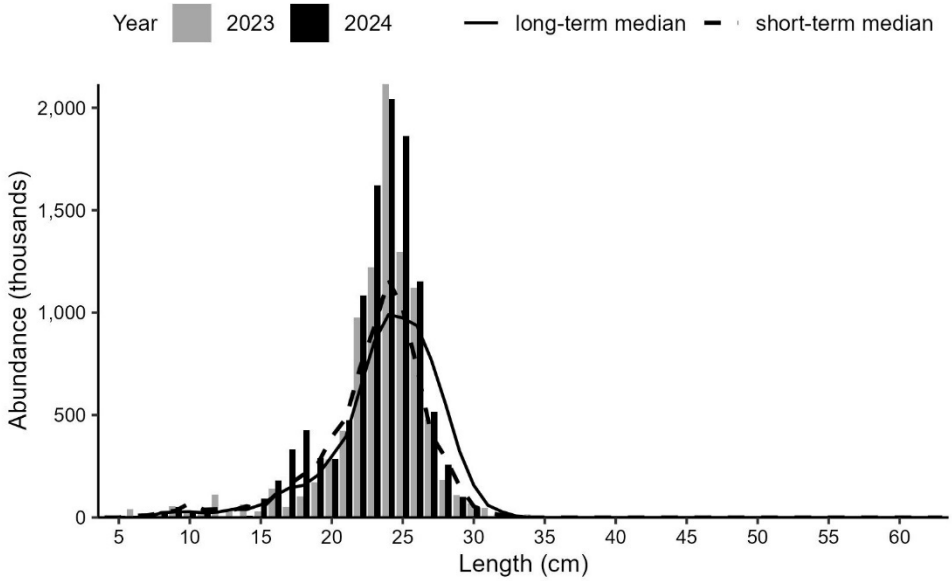

Figure 18c. Numbers-at-length (NAL) indices for Longhorn Sculpin in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

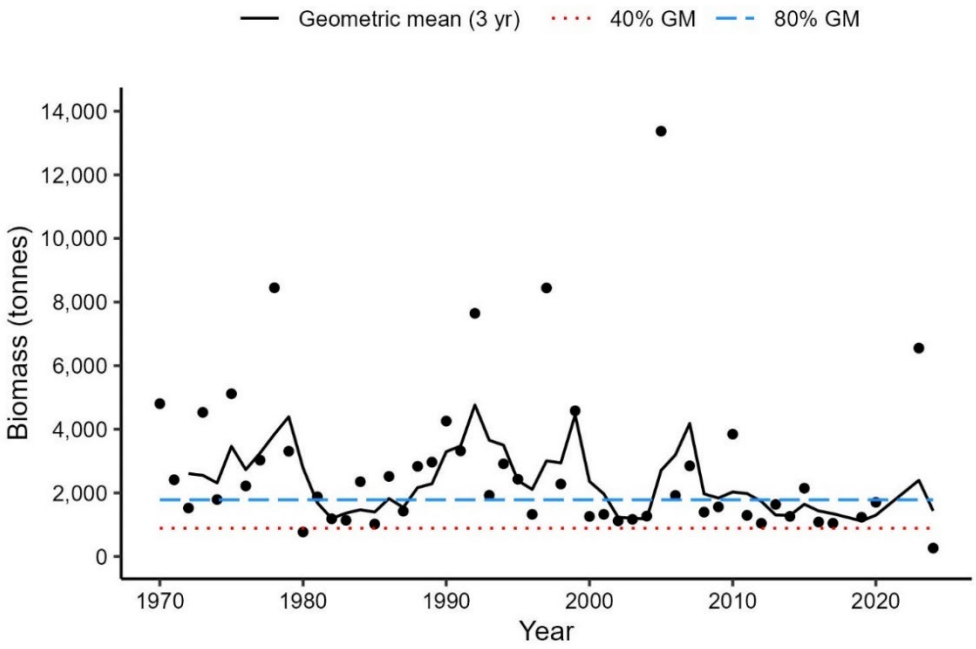

Figure 18d. Biomass index for Longhorn Sculpin in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

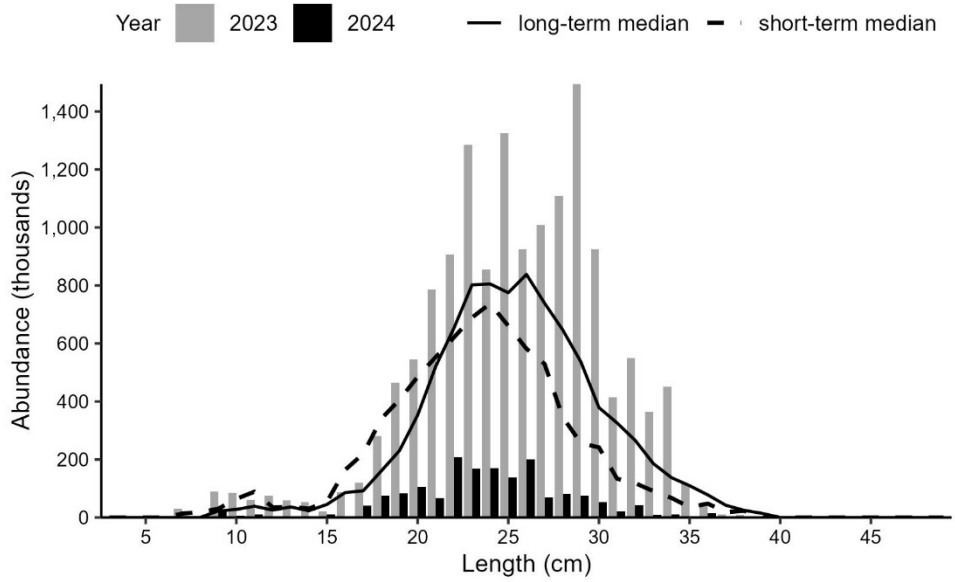

Figure 18e. Numbers-at-length (NAL) indices for Longhorn Sculpin in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 20109–2020.

Barndoor Skate

Barndoor Skate (*Dipturus laevis*) were caught primarily on Georges Bank and the surrounding deeper waters (Figure 19a). The biomass index for Barndoor Skate in 4X decreased in 2024 but remains high in comparison to the historical time series (Figure 19b). Since the late 1990s, the 3-yr median biomass has shown an increasing trend and is the highest in the time series in 2024. Prior to 1998, catches were close to zero for all sizes of Barndoor Skates in 4X and 4VW, so the long-term median indices are zero for the vast majority of lengths. In 2024, Barndoor Skates were caught at lengths ranging from 54 to 125 cm in 4X (Figure 19c). In 4VW, the 2024 biomass index is similar to values observed in the last decade (Figure 19d); however, only 10 individuals were captured (Figure 19e).

Barndoor Skate are a large, wide ranging fish which prefer the warmer waters in the Maritimes Region. When reviewed by the Committee on the Status of Endangered Wildlife in Canada, the Designatable Unit included 4VWX5Zc; all of the area typically covered by the Summer Ecosystem RV Survey since 2011. In 2024, Barndoor skate were caught in every set on Georges Bank (5Zc) with a biomass index of 769 t. In 4X, 23% fewer individuals were caught compared to on Georges Bank, but the 2024 4X biomass index is close to three times higher (2,145 t). This is reflective of the smaller individuals captured on Georges Bank with an average length of 61 cm compared to an average length of 95 cm in 4X. In the winter, few Barndoor Skate are caught on top of Georges Bank (5Z1+2), as they move off the bank into deeper waters of the Fundian Channel and Gulf of Maine. Given their seasonal movements and preference for warmer water, it may be more informative to look at biomass trends for Barndoor Skates for the survey area as a whole rather than separately for NAFO Divisions.

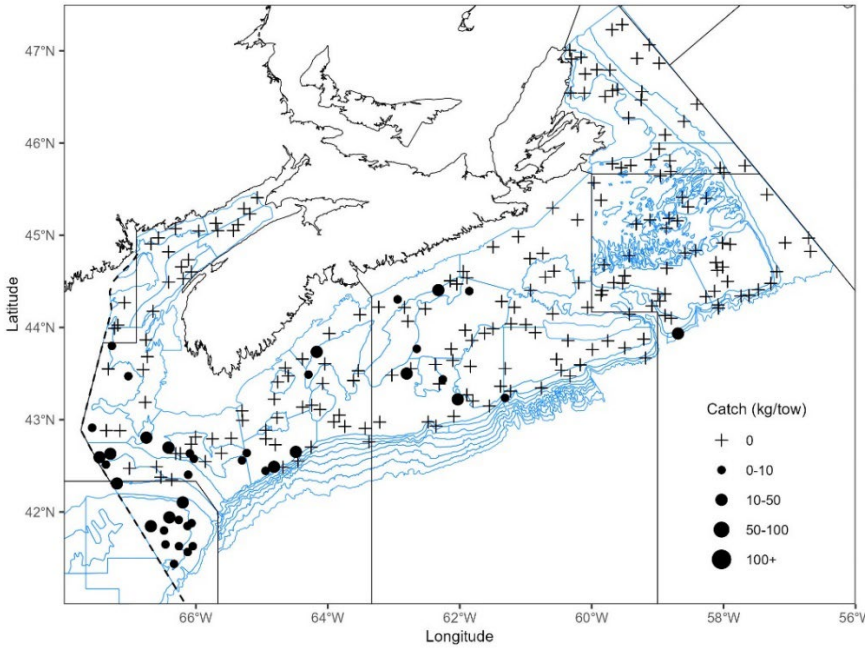

Figure 19a. Distribution of Barndoor Skate catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

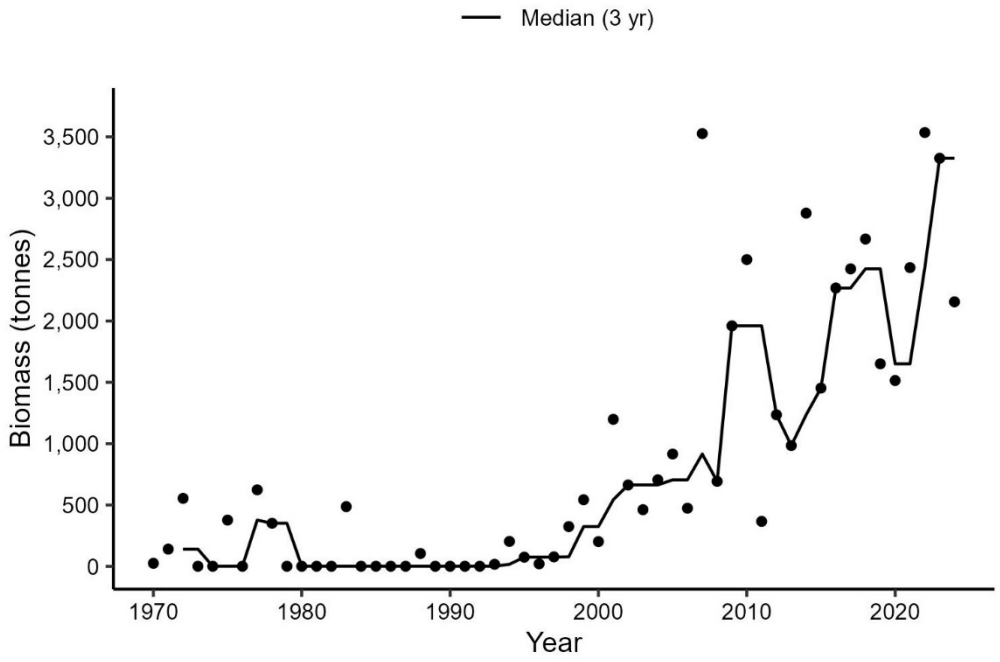

Figure 19b. Biomass index for Barndoor Skate in 4X from the Summer Ecosystem RV Survey. The three-year median biomass index is represented by the solid black line. The black dots represent the biomass index for that year.

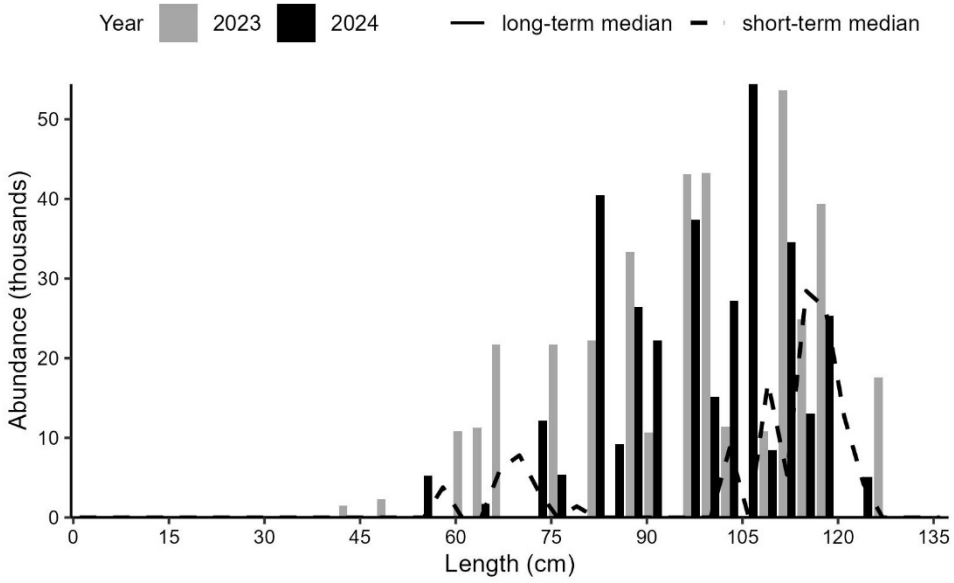

Figure 19c. Numbers-at-length (NAL) indices for Barndoor Skate in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

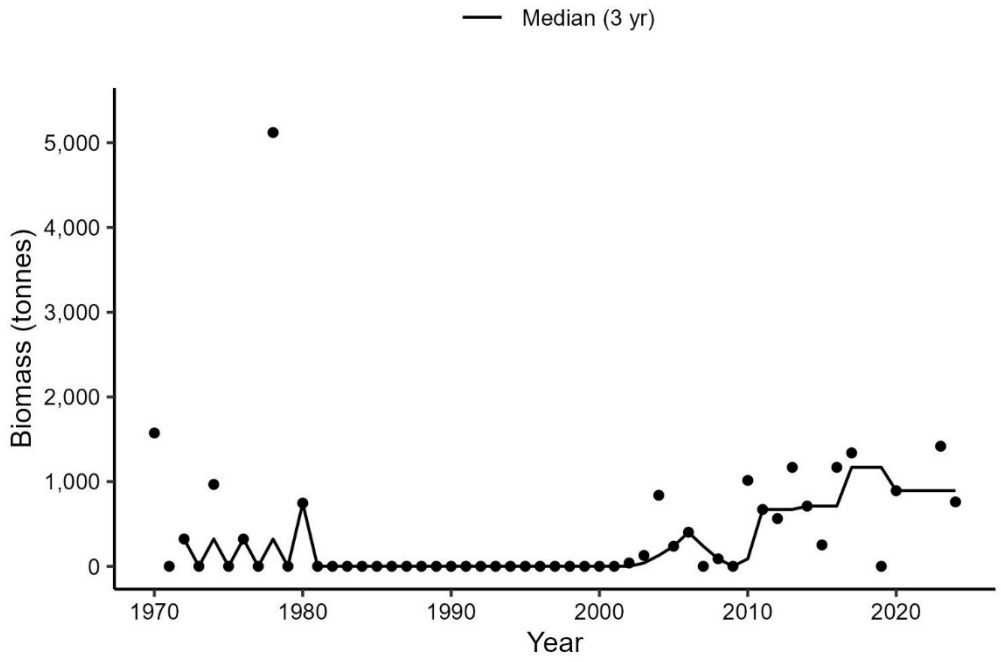

Figure 19d. Biomass index for Barndoor Skate in 4VW from the Summer Ecosystem RV Survey. The three-year median biomass index is represented by the solid black line. The black dots represent the biomass index for that year.

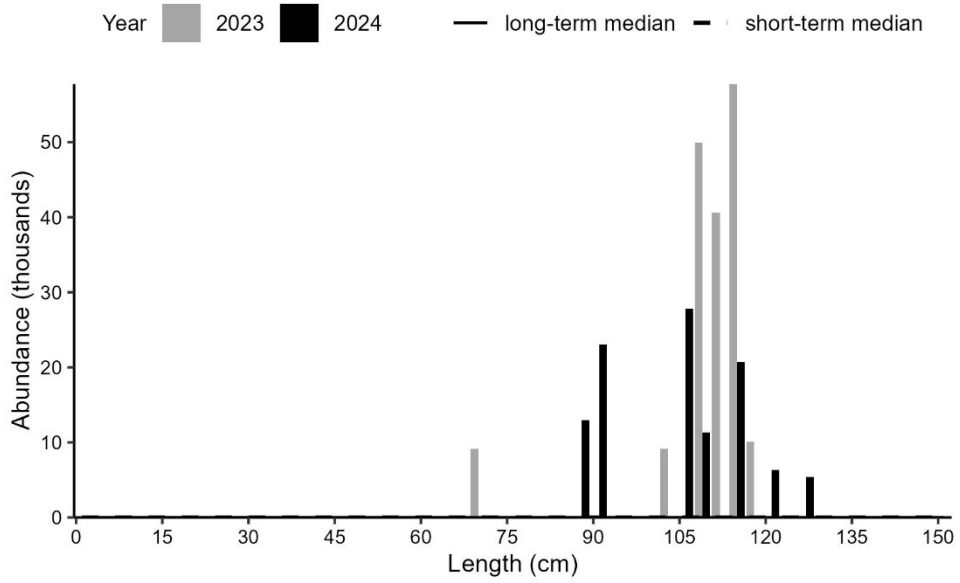

Figure 19e. Numbers-at-length (NAL) indices for Barndoor Skate in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Thorny Skate

In 2024, Thorny Skate (*Amblyraja radiata*) were predominantly captured in 4V with fewer catches occurring in 4W or 4X (Figure 20a). In 4X, the biomass index and 3-yr GM have remained stable at low levels below the 40% long-term GM since 2009 (Figure 20b). Only 14 individuals were observed in 4X, although some were larger in comparison to the short-term median (Figure 20c). In 4VW, the 3-yr GM has also remained below the 40% long-term GM since 2012 (Figure 20d). NAL indices are similar to or above the short-term median for lengths greater than 43 cm, but below for smaller lengths (Figure 20e).

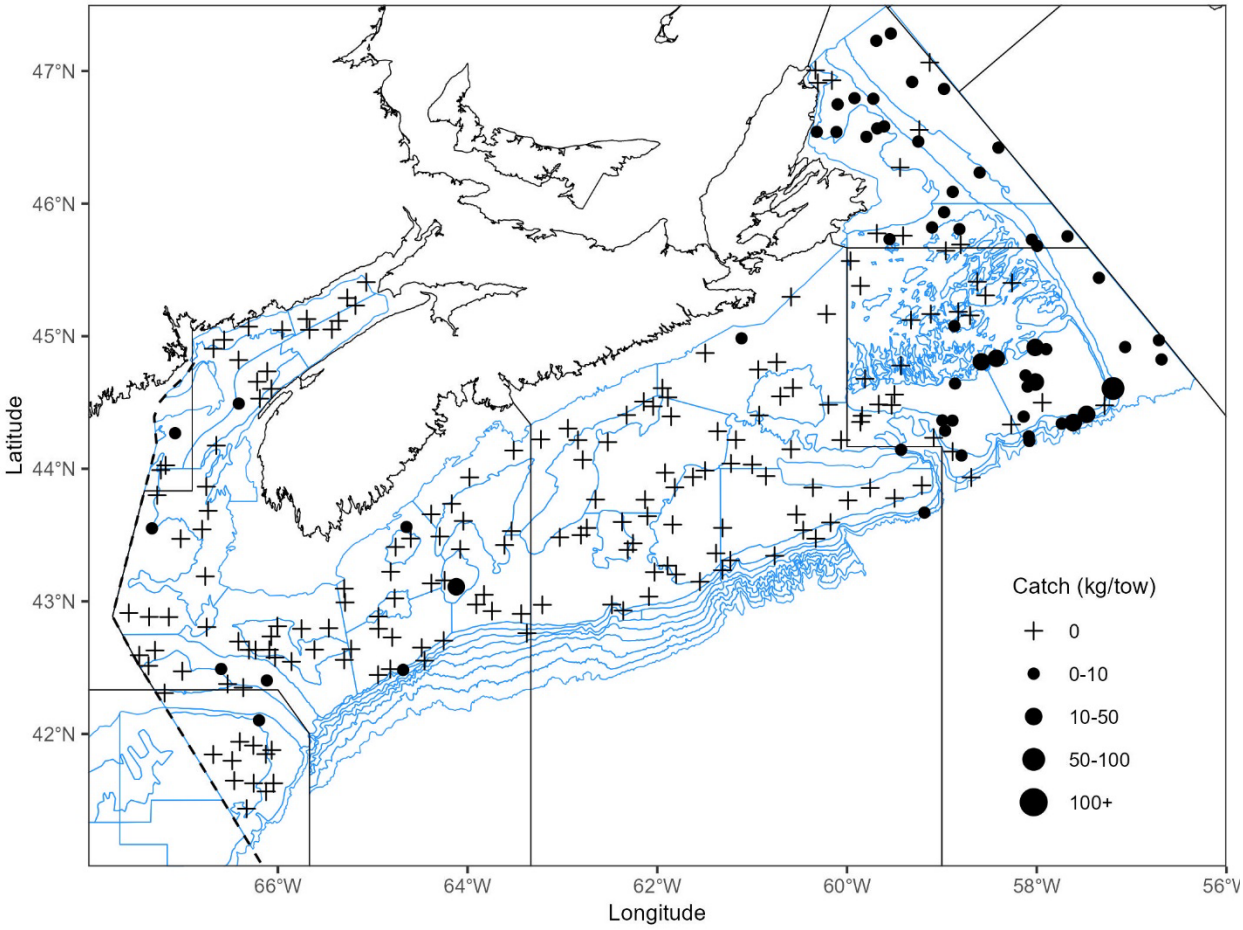

Figure 20a. Distribution of Thorny Skate catches during the 2024 Summer Ecosystem RV Survey including the Laurentian channel and Georges Bank. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

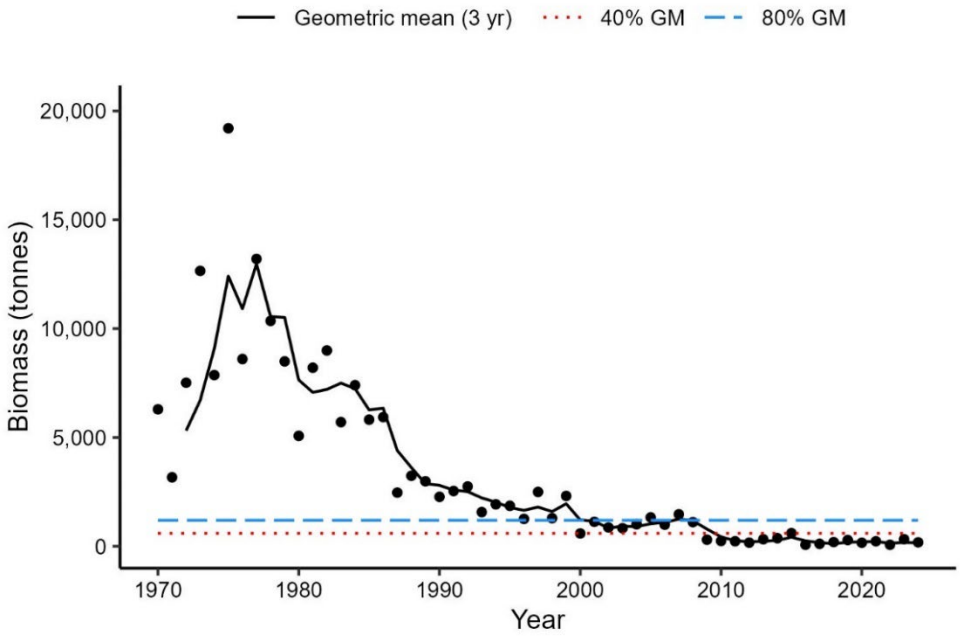

Figure 20b. Biomass index for Thorny Skate in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

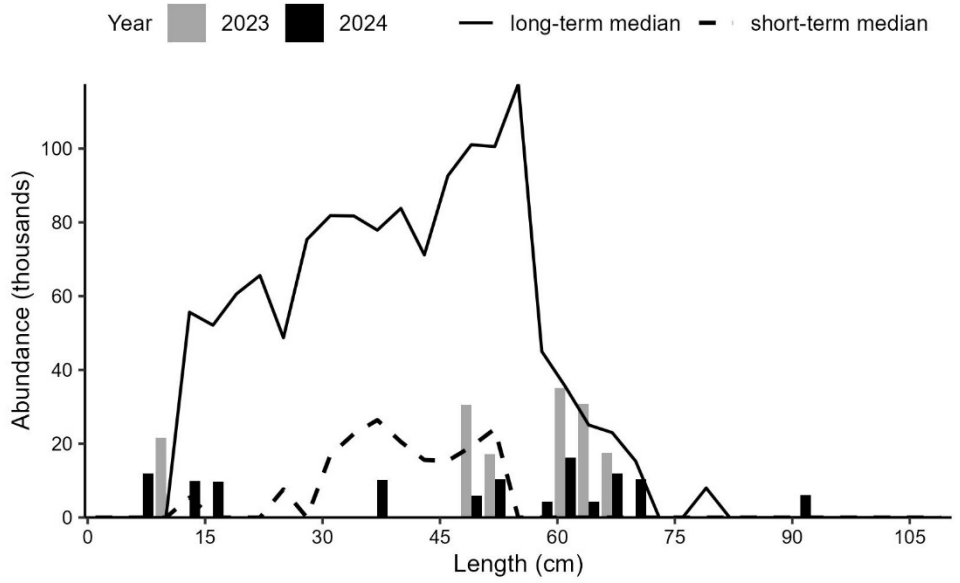

Figure 20c. Numbers-at-length (NAL) indices for Thorny Skate in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

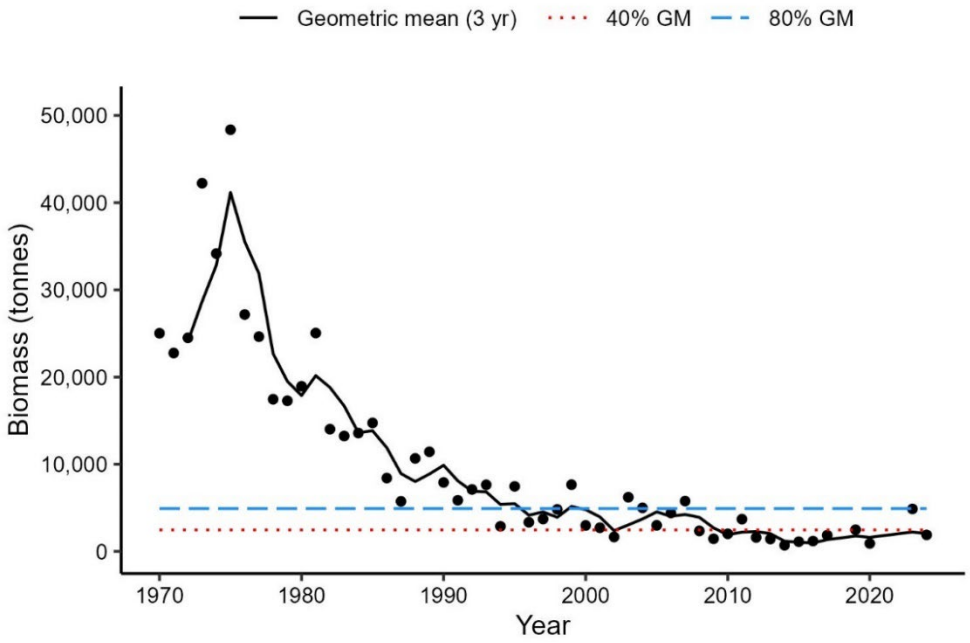

Figure 20d. Biomass index for Thorny Skate in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

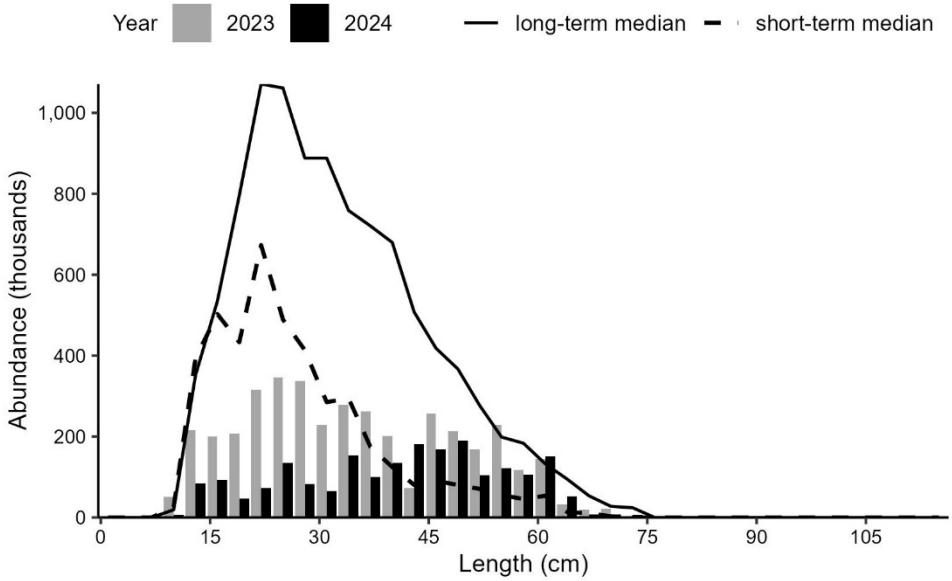

Figure 20e. Numbers-at-length (NAL) indices for Thorny Skate in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Winter Skate

Winter Skate (*Leucoraja ocellata*) and Little Skate (*Leucoraja erinacea*) cannot be reliably distinguished at lengths less than about 40 cm (for more information, see McEachran and Musick 1973). The practice at sea in most years was to record immature Winter and Little Skates for which the identification was uncertain as Winter Skates. Given that the majority of the skates recorded as Winter Skates in the surveys are in this length range, the biomass trends were influenced by the contribution of fish for which identification was uncertain. For this document, only Winter Skates above 40 cm are included in calculating the biomass indices.

Winter Skate were caught primarily on Georges Bank with smaller catches on Browns Bank and in the Bay of Fundy (Figure 21a). In 4X, the 3-yr GM remains above 80% of the long-term GM but has decreased in consecutive years (Figure 21b). NAL indices are generally above both the long-term and short-term medians for lengths above 64 cm (Figure 21c). In 4VW, the 3-yr GM has been below the 40% long-term GM since 2010 (Figure 21d). For the lengths captured, NAL indices are generally above or similar to the long-term median (Figure 21e).

The 2024 biomass index for Winter Skate on Georges Bank (5Zc) is 13,546 t, which is 18 times higher than the index in 4X. The designatable unit for Winter Skate includes both 4X and 5Z; however, they are not often caught in the deeper water of the Fundian Channel between Browns Bank and Georges Bank. While it may be appropriate to review the biomass trends for 4X and 5Zc separately, summer survey data may be useful in reviewing the status of Winter Skate on Georges Bank.

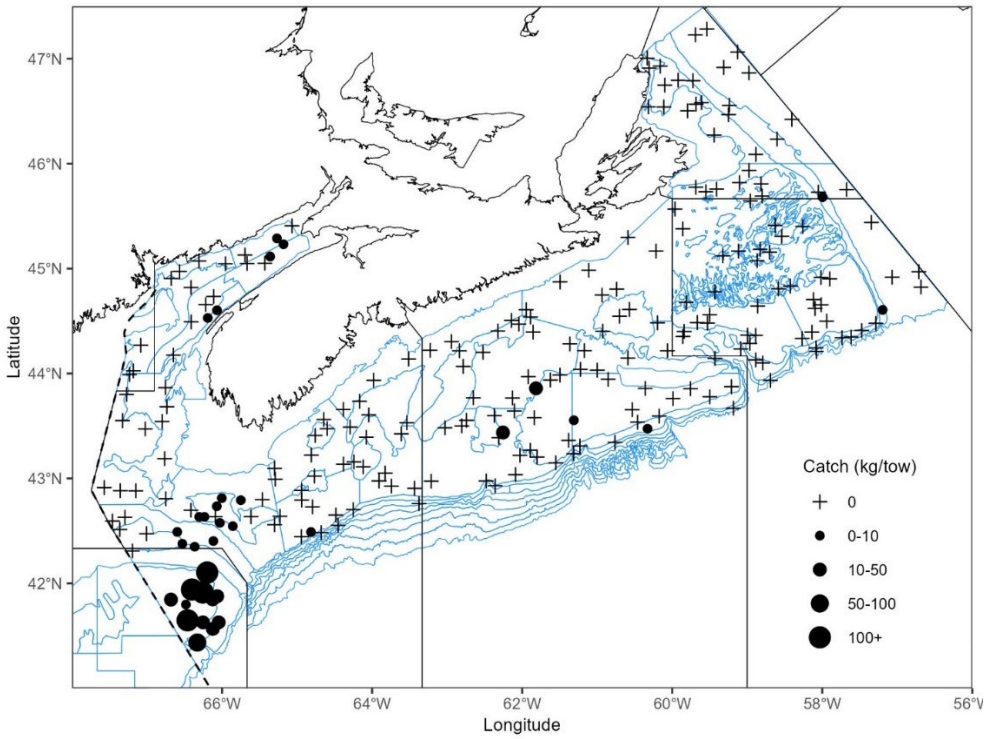

Figure 21a. Distribution of Winter Skate catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

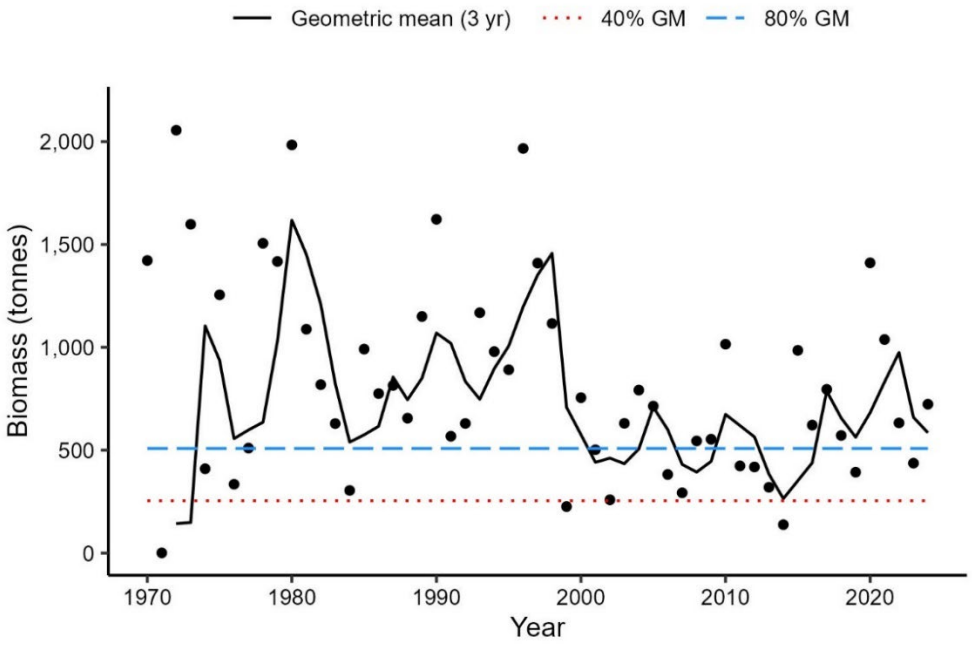

Figure 21b. Biomass index for Winter Skate above 40 cm in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

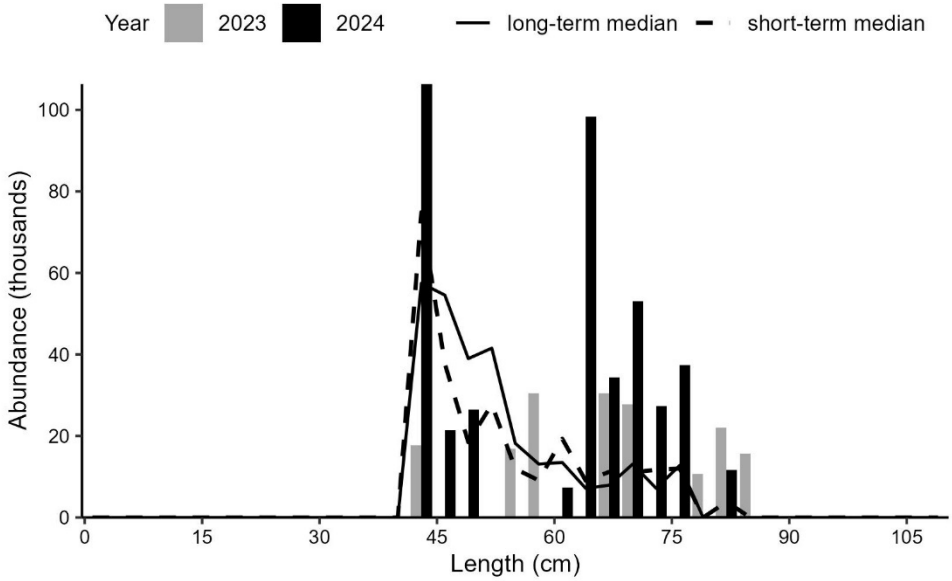

Figure 21c. Numbers-at-length (NAL) indices for Winter Skate above 40 cm in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

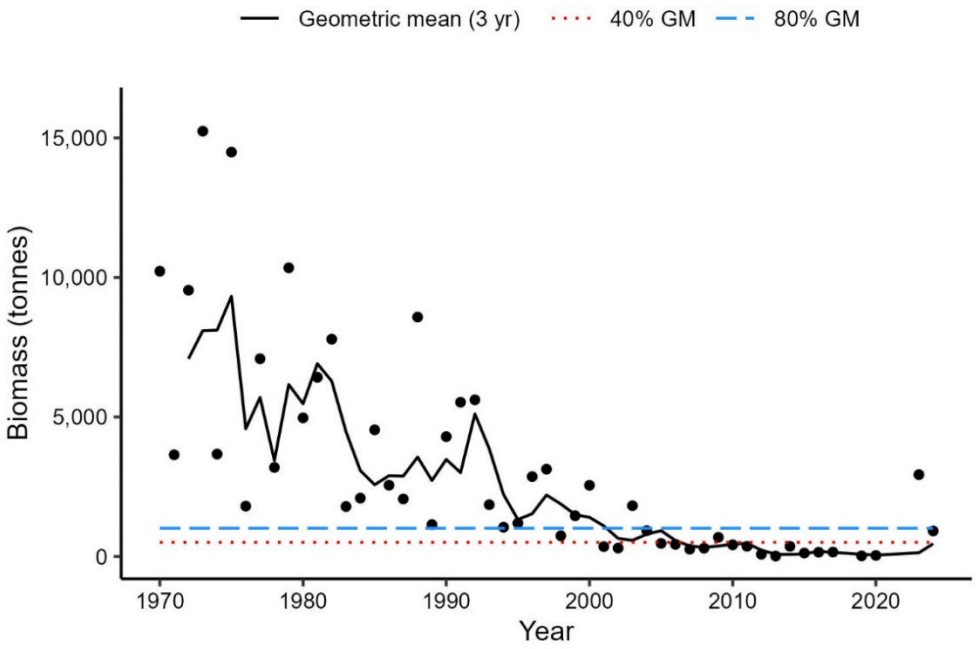

Figure 21d. Biomass index for Winter Skate in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

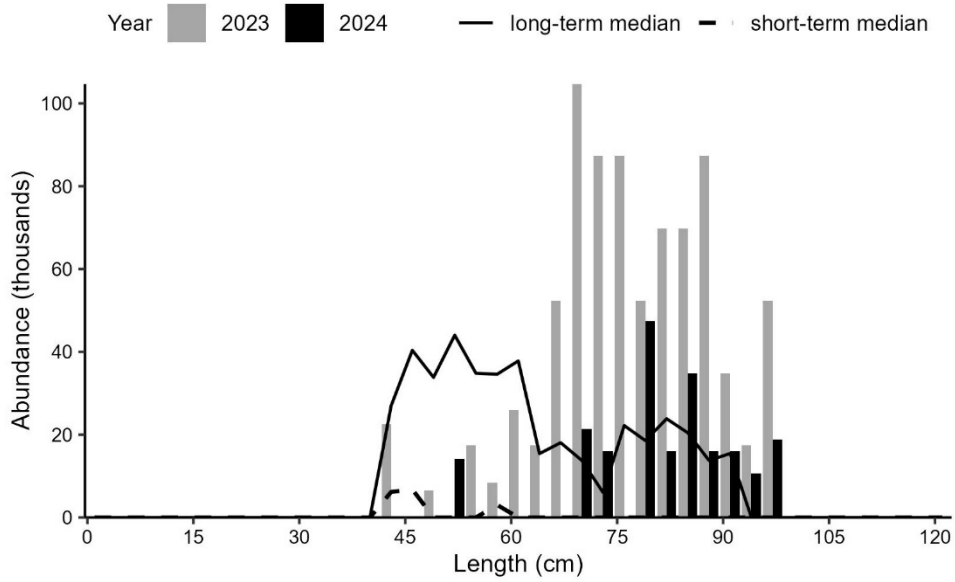

Figure 21e. Numbers-at-length (NAL) indices for Winter Skate in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Little Skate

Winter Skate and Little Skate cannot be reliably distinguished when immature (for more information, see McEachran and Musick 1973). The practice at sea in most years was to record these immature skates as Winter Skates. Little Skate begin to mature at about 32 cm and can then be easily distinguished from Winter Skate. For this document, only Little Skates above 32 cm are included in biomass and NAL indices.

Little Skate were caught primarily on Georges Bank, Browns Bank and in the Bay of Fundy (Figure 22a). The biomass index and 3-yr GM for 4X declined again in 2024 from the time series high in 2022, but both remain above the 80% long-term GM (Figure 22b). NAL indices for 4X are generally below the short-term median for most lengths and above the long-term median for fish below 46 cm (Figure 22c). The geographic range of Little Skate does not extend far into 4VW and catches are historically very small; however, the 3-yr GM in 2024 remains above the 80% long-term GM (Figure 22d). Compared to 2023, NAL indices are generally similar or lower in 2024 (Figure 22e).

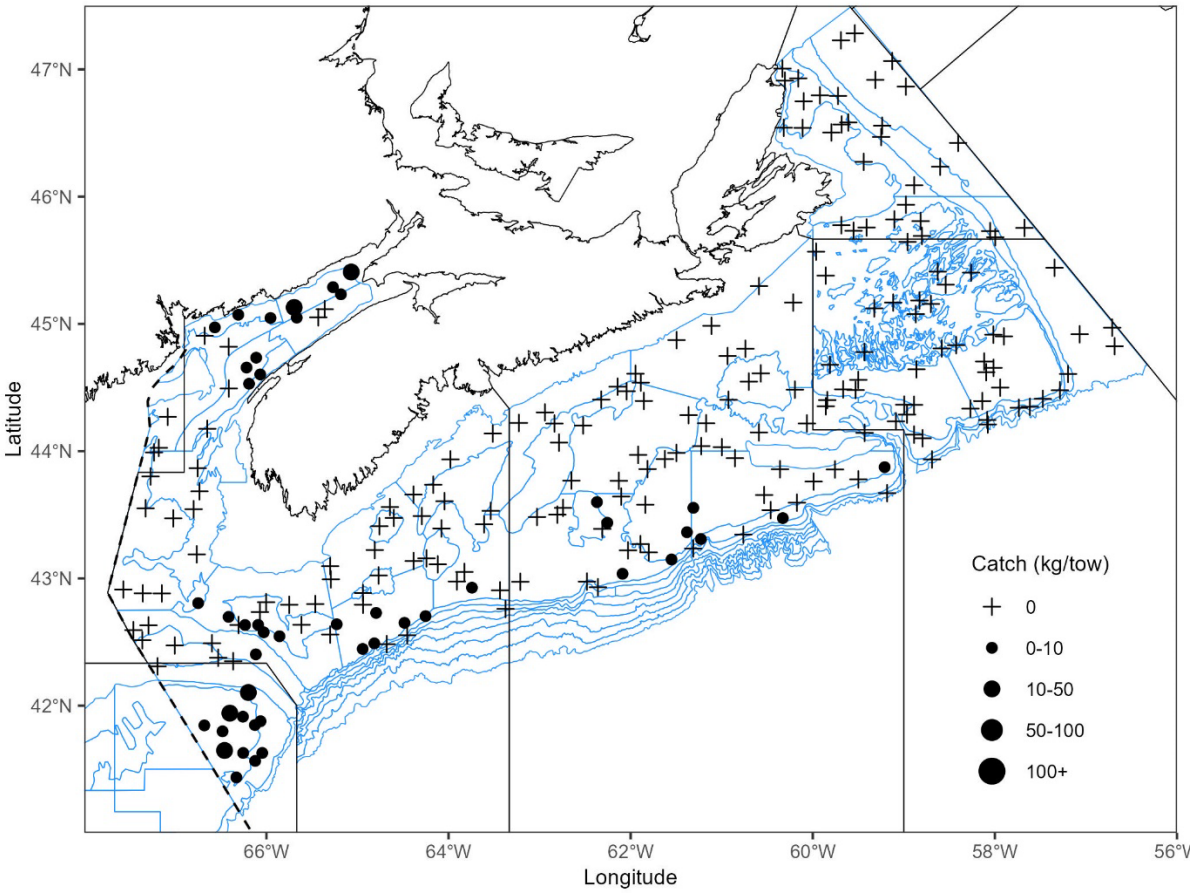

Figure 22a. Distribution of Little Skate catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

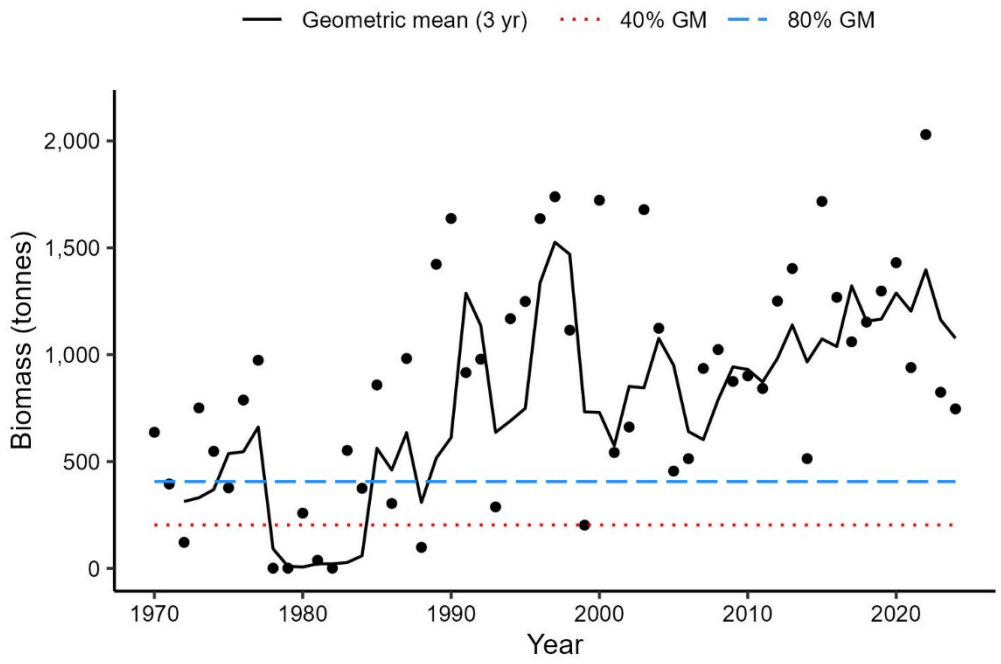

Figure 22b. Biomass index for Little Skate in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

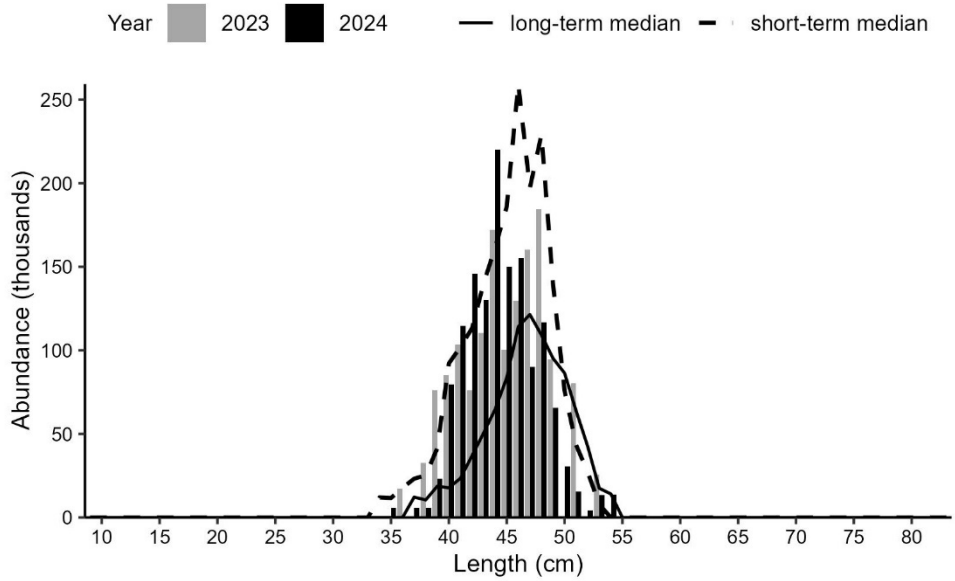

Figure 22c. Numbers-at-length (NAL) indices for Little Skate in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

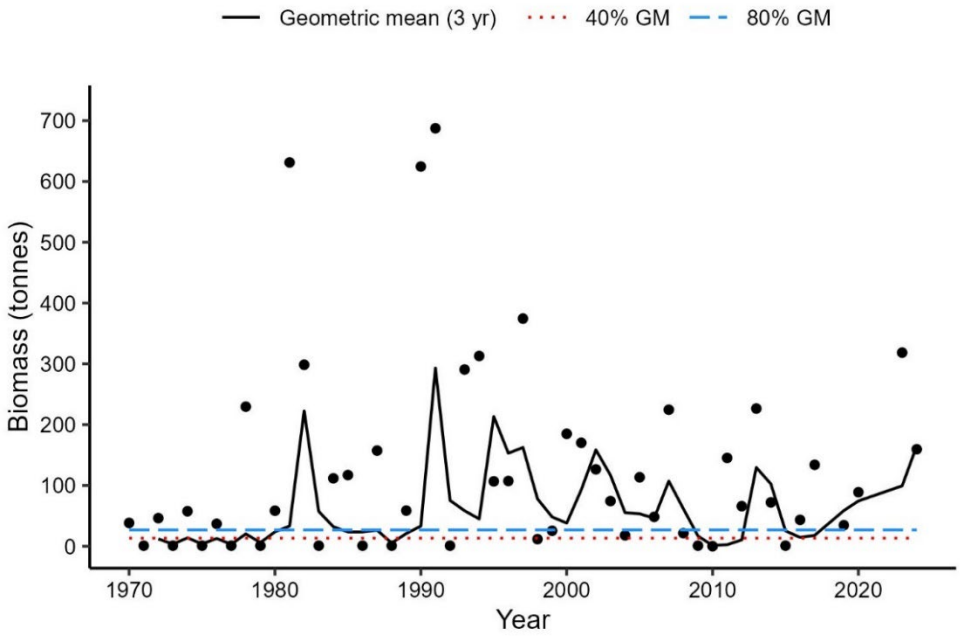

Figure 22d. Biomass index for Little Skate in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

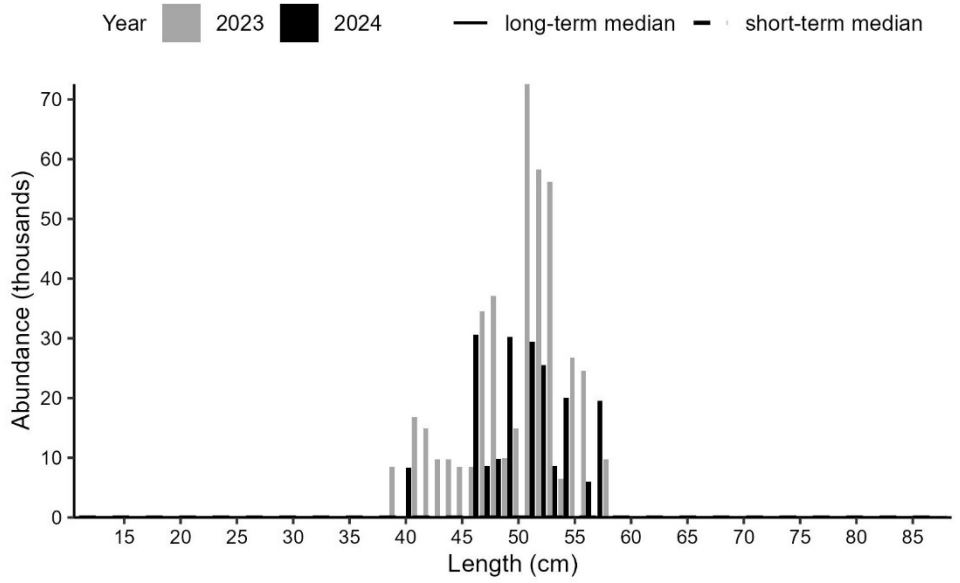

Figure 22e. Numbers-at-length (NAL) indices for Little Skate in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Smooth Skate

Smooth Skate (*Malacoraja senta*) are generally caught at the eastern and western ends of the survey area with fewer catches occurring in 4W (Figure 23a). In 4X, the 3-yr GM increased from its lowest point in the early 1990s and has continued to fluctuate around 80% of the long-term GM in recent years. In 2024, the biomass index fell below the 80% long-term GM while the 3-yr GM remains above (Figure 23b). For the majority of lengths observed in 4X in 2024, NAL indices are generally higher than both the short-term and long-term medians (Figure 23c). The 2024 biomass index for 4VW fell below the 40% long-term GM but the 3-yr GM remains between the 40% and 80% long-term GM (Figure 23d). Similar to 4X, biomass in 4VW declined significantly during the 1980s but has not shown any signs of rebuilding since then and has instead remained at low levels. NAL indices in 4VW are generally below both the short-term and long-term medians for most lengths in 2024 (Figure 23e).

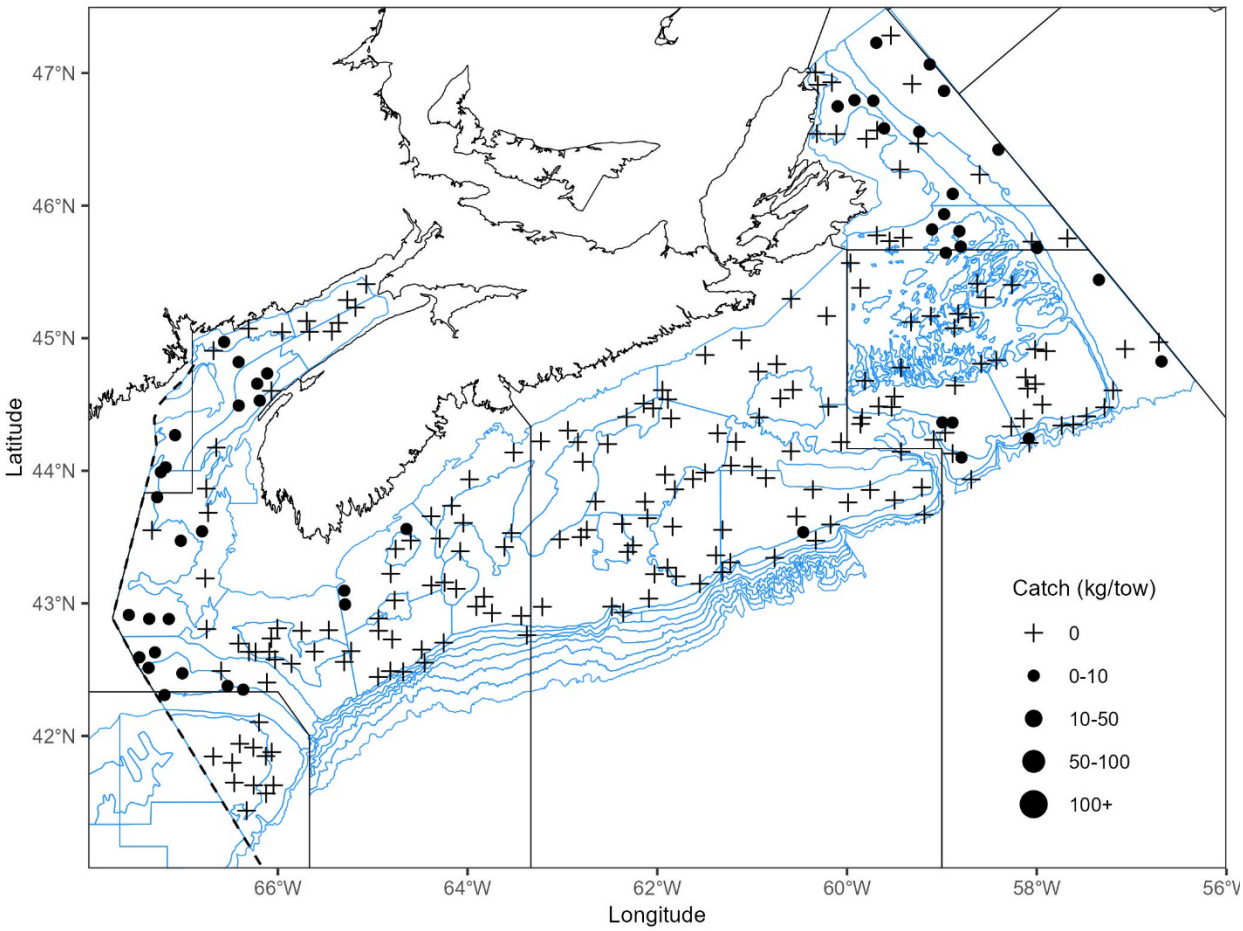

Figure 23a. Distribution of Smooth Skate catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

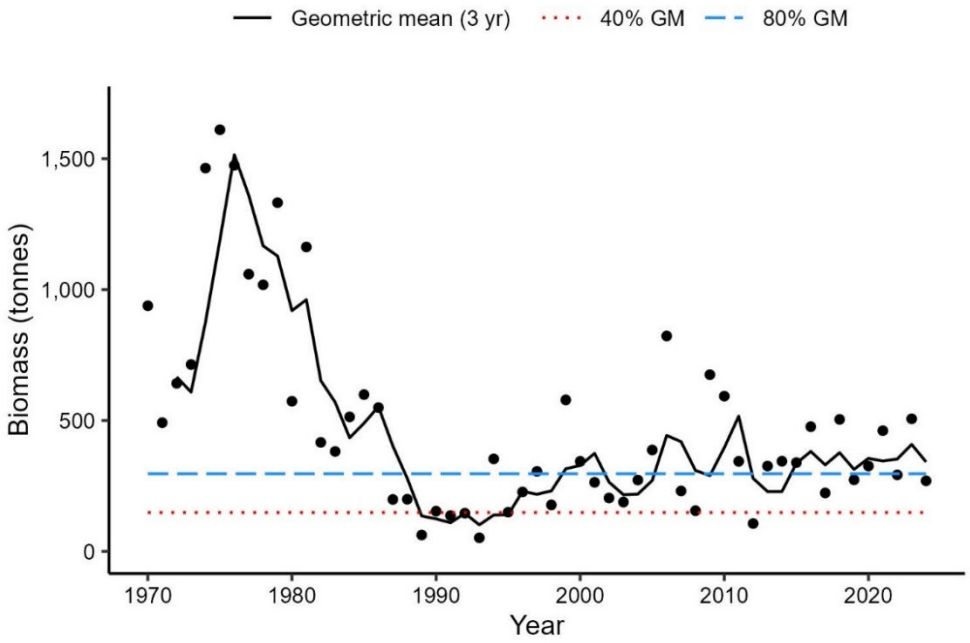

Figure 23b. Biomass index for Smooth Skate in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

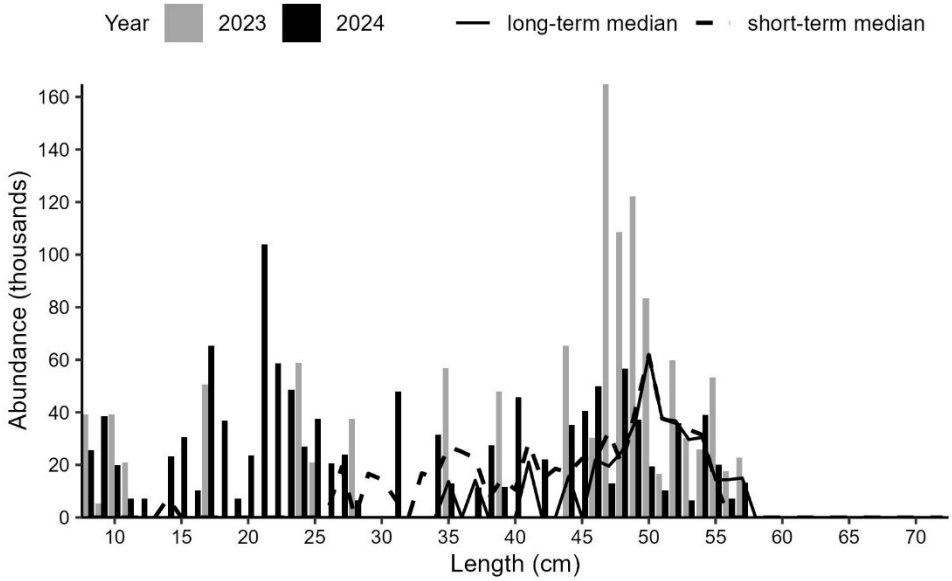

Figure 23c. Numbers-at-length (NAL) indices for Smooth Skate in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

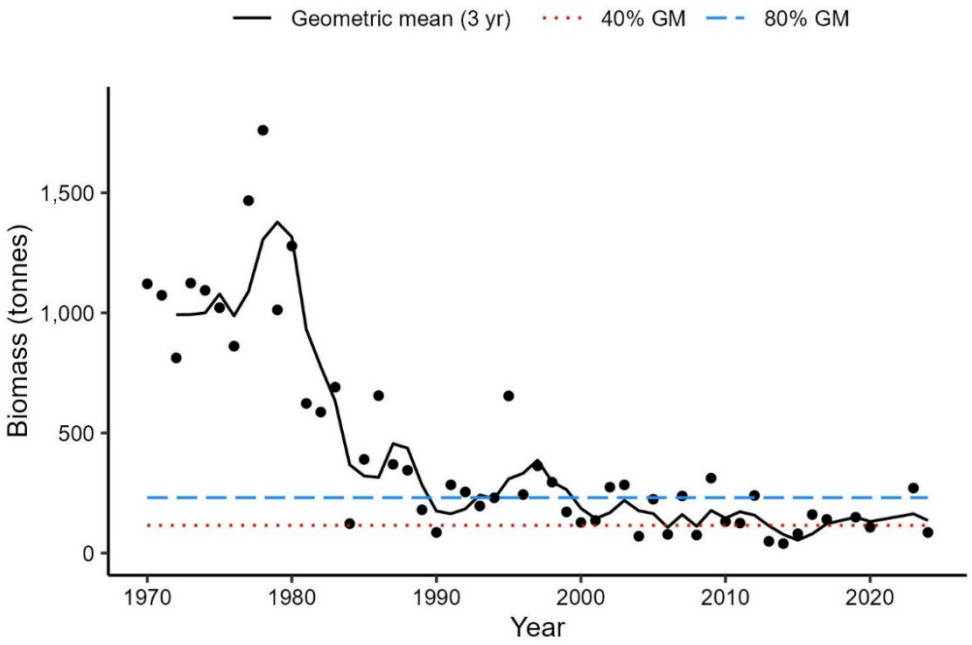

Figure 23d. Biomass index for Smooth Skate in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

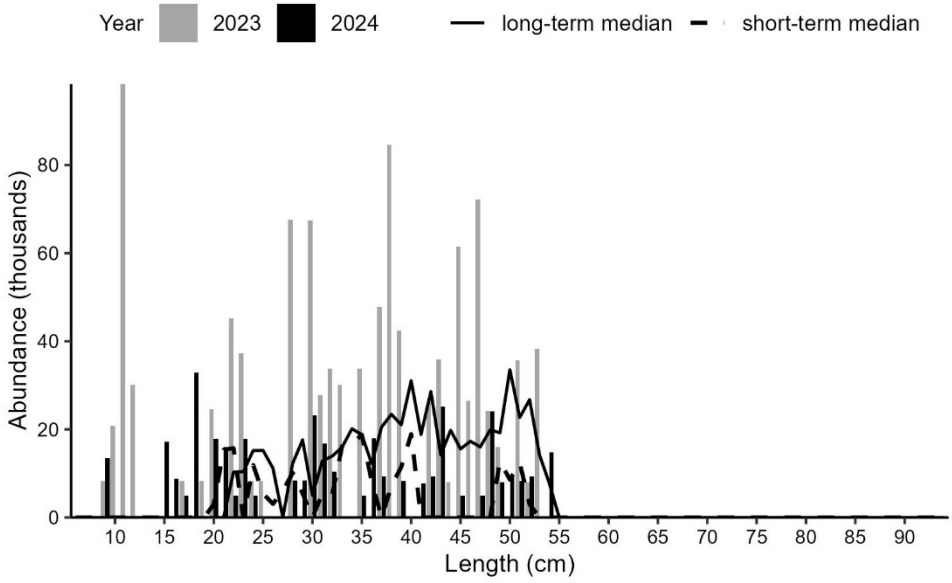

Figure 23e. Numbers-at-length (NAL) indices for Smooth Skate in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Spiny Dogfish

Spiny Dogfish (*Squalus acanthias*) are well distributed in 4X and on Georges Bank but catches within 4V and 4W are much less frequent (Figure 24a). Catches in 4X contribute on average approximately 95% of the total biomass for the index area.

Inter-annual variability in survey catch is high for Spiny Dogfish. In 4VWX, the 3-yr GM remains above 80% of the long-term GM in 2024 and has not declined below this threshold since 2014 (Figure 24b). The indices-at-length are generally similar to the median values for most lengths in 2024 (Figure 24c). The Spiny Dogfish population extends across the Canada-US boundary, with the majority of the population in US waters in most years (DFO 2020). The biomass index on the Canadian portion of Georges Bank in 2024 is 27,490 t compared to 75,260 t for 4X.

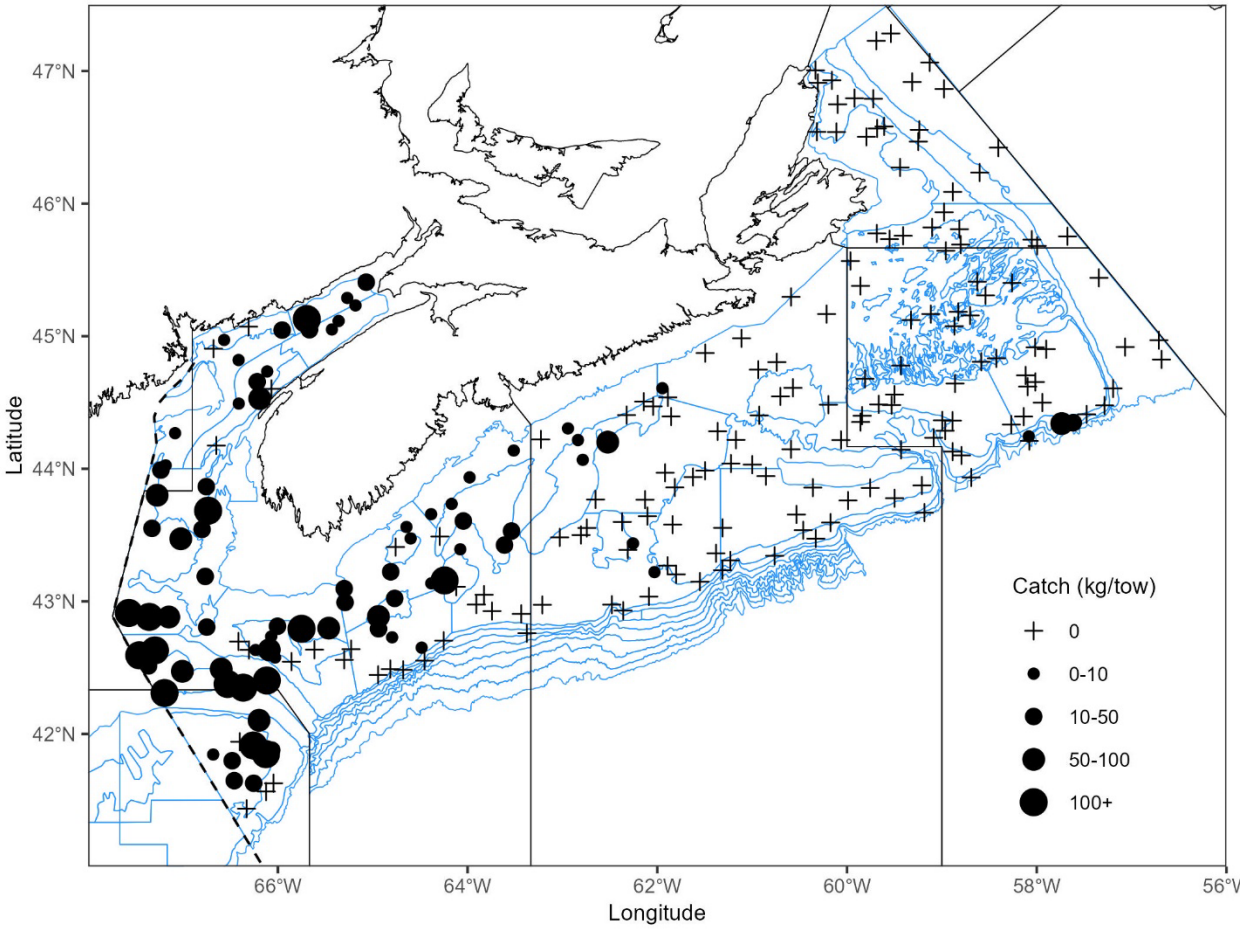

Figure 24a. Distribution of Spiny Dogfish catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

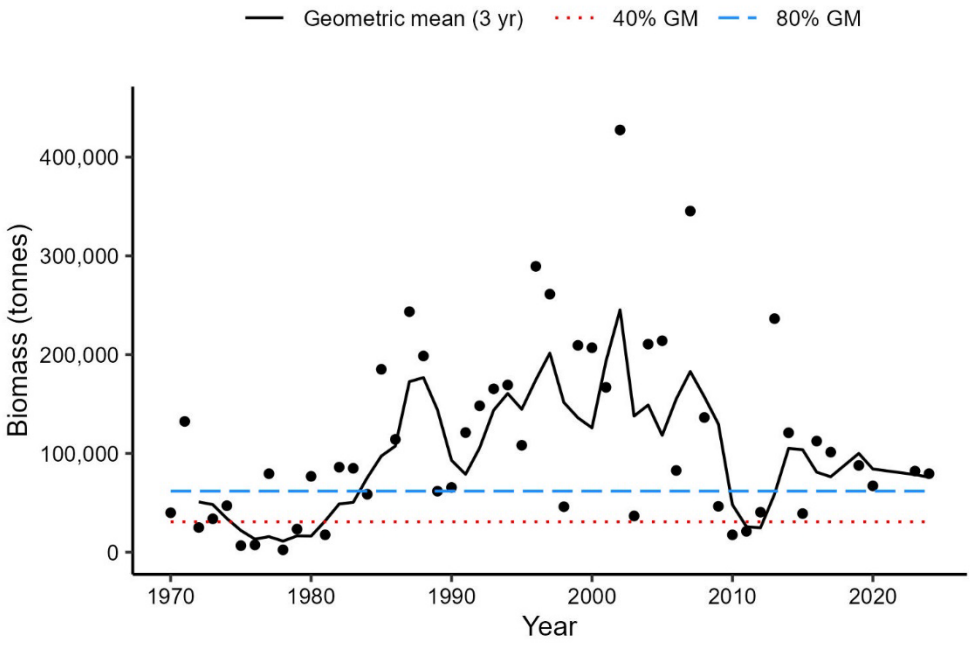

Figure 24b. Biomass index for Spiny Dogfish in 4VWX from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

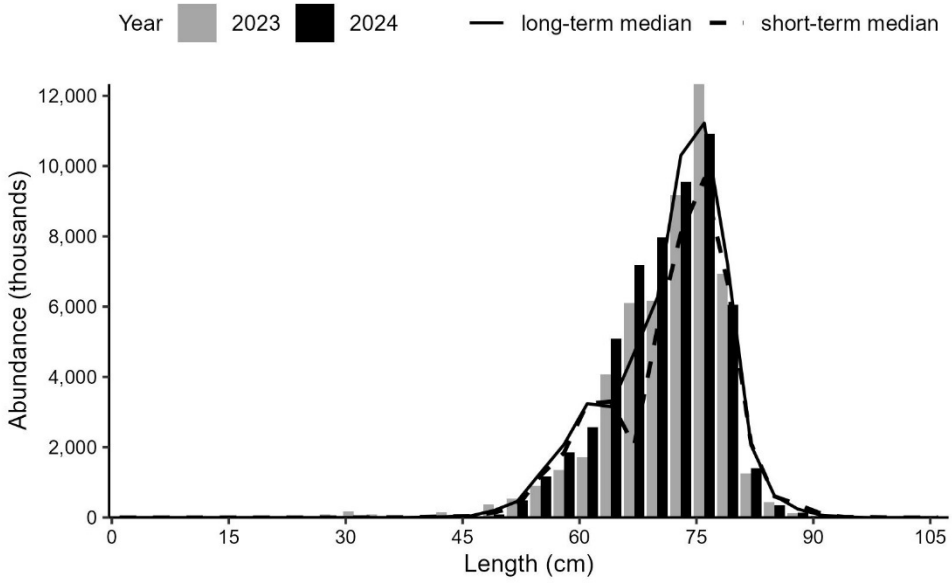

Figure 24c. Numbers-at-length (NAL) indices for Spiny Dogfish in 4VWX from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Red Hake

Red Hake can be difficult to distinguish from White Hake. Prior to about 1982, these two species were not consistently separated (Clark and Emberley 2011). The standard guide to Canadian Atlantic Fishes (Leim and Scott 1966) did not differentiate between them.

In 2024, Red Hake were caught throughout 4X and 4W, but were only encountered in three sets within 4V (Figure 25a). In 4X, the biomass index has decreased significantly over the last two years, however, the 3-yr GM is the highest in the time series in 2024 (Figure 25b). The short-term median NAL is generally higher than the long-term median values in 4X, indicating a general increase in NAL in the last decade. In 2023, two separate year classes were evident in the 4X length distributions peaking at around 21 and 31 cm, however, only one main year class was observed in 2024 which peaked at around 26 cm (Figure 25c). The 2024 biomass index and 3-yr GM in 4VW are both above the 80% long-term GM and remain similar to 2023 (Figure 25d). Similar to 4X, NAL indices are generally similar to or higher than the long-term and short-term medians except for smaller fish below 20 cm (Figure 25e).

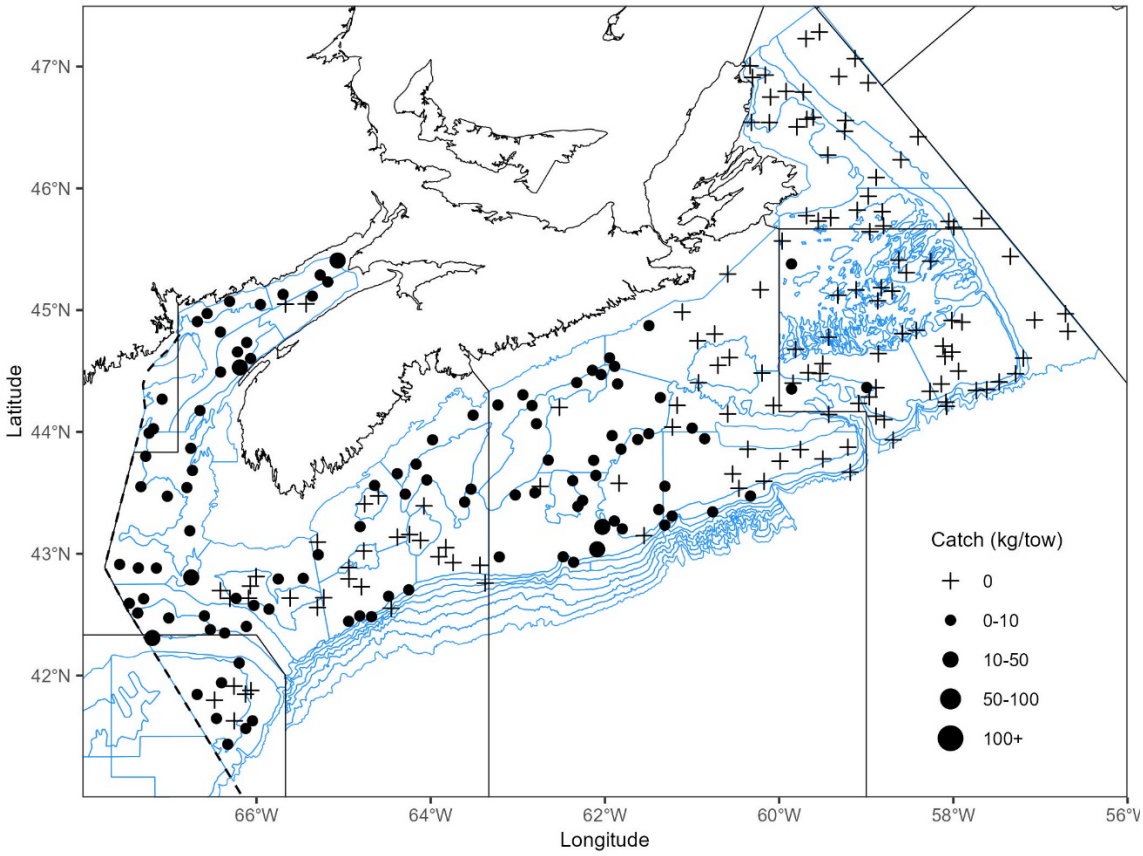

Figure 25a. Distribution of Red Hake catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

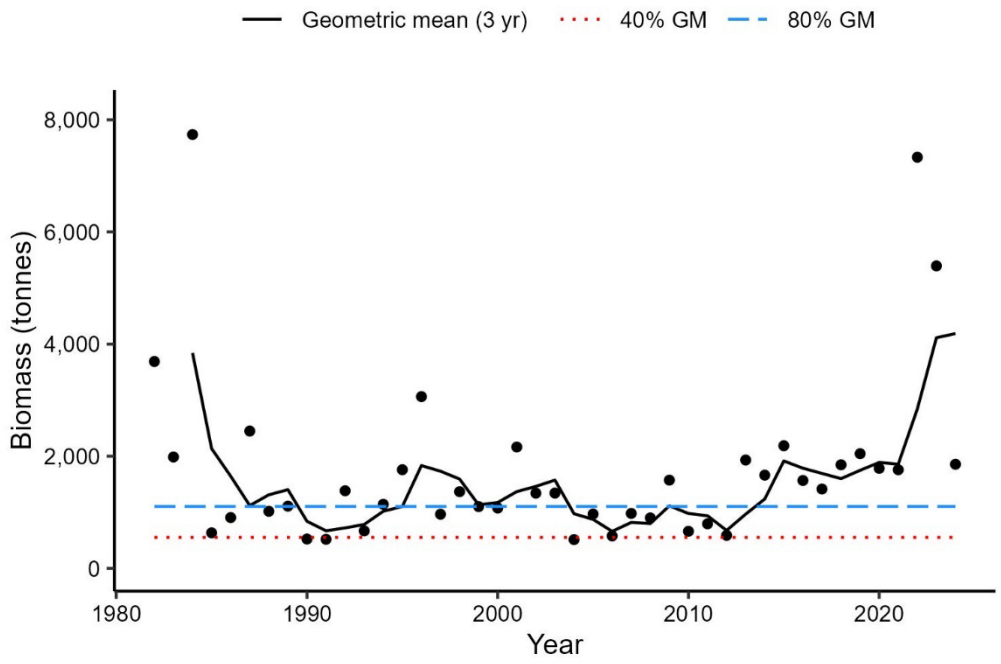

Figure 25b. Biomass index for Red Hake in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1982–2023), respectively. The black dots represent the biomass index for that year.

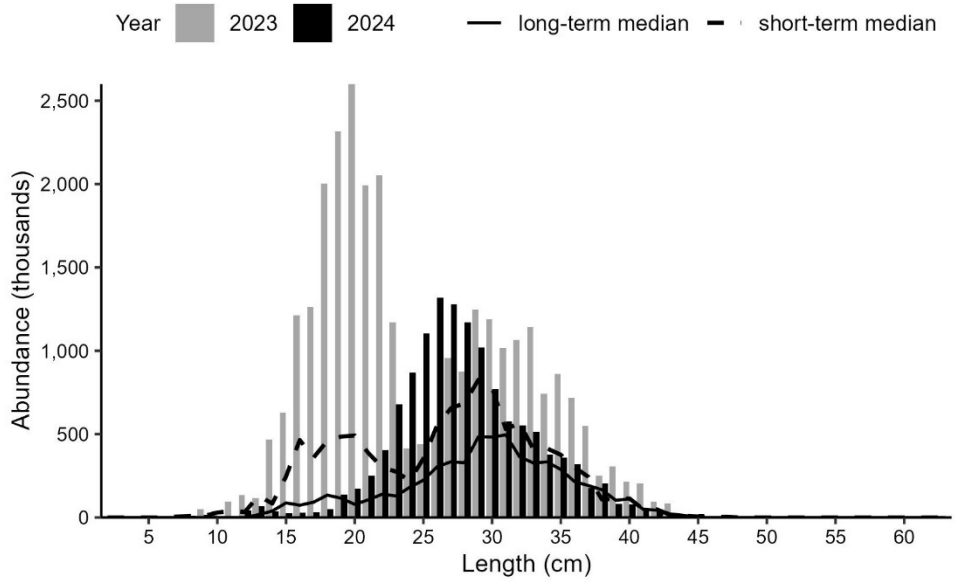

Figure 25c. Numbers-at-length (NAL) indices for Red Hake in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023survey. The solid black line represents the median NAL for the time period 1982–2022. The dashed black line represents the median NAL for the time period 2013–2022.

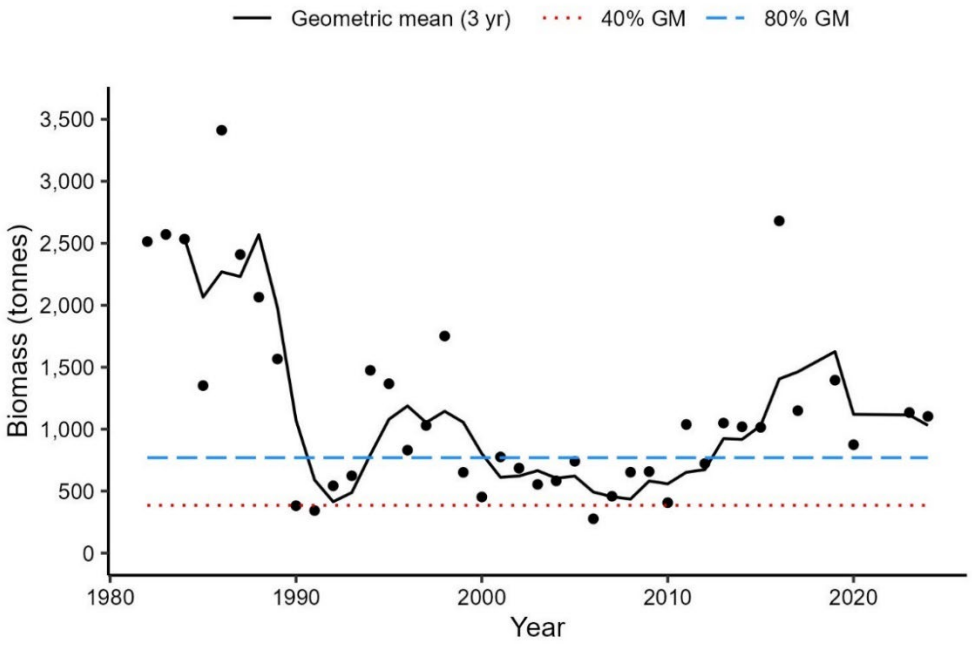

Figure 25d. Biomass index for Red Hake in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1982–2023), respectively. The black dots represent the biomass index for that year.

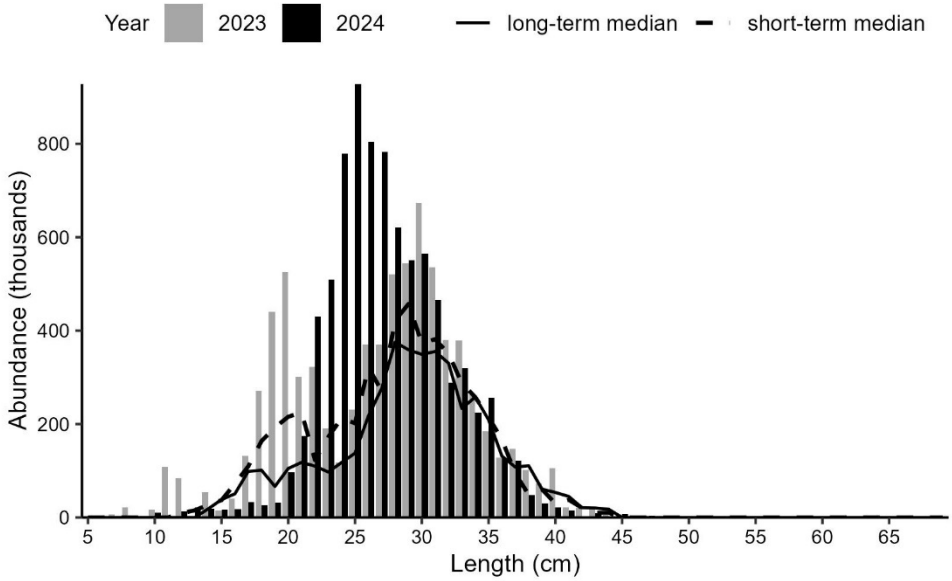

Figure 25e. Numbers-at-length (NAL) indices for Red Hake in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1982–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Sea Raven

Sea Raven (*Hemitripterus americanus*) were predominantly caught in the Bay of Fundy, on Georges Bank and on Browns Bank in 2024 (Figure 26a). In 4X, the 2024 biomass index decreased to the second lowest of the time series while the 3-yr GM decreased to the lowest point in the time series. However, the biomass index and the 3-yr GM remain above the 40% long-term GM (Figure 26b). The 2024 indices at length in 4X are generally below both the long-term and short-term medians for most lengths (Figure 26c). In 4VW, the 2024 biomass index is the lowest in the time series and well below the 40% long-term GM while the 3-yr GM decreased to below the 80% long-term GM for the first time since 2014 (Figure 26d). NAL indices are below both the short-term and long-term medians except for fish above 54 cm (Figure 26e).

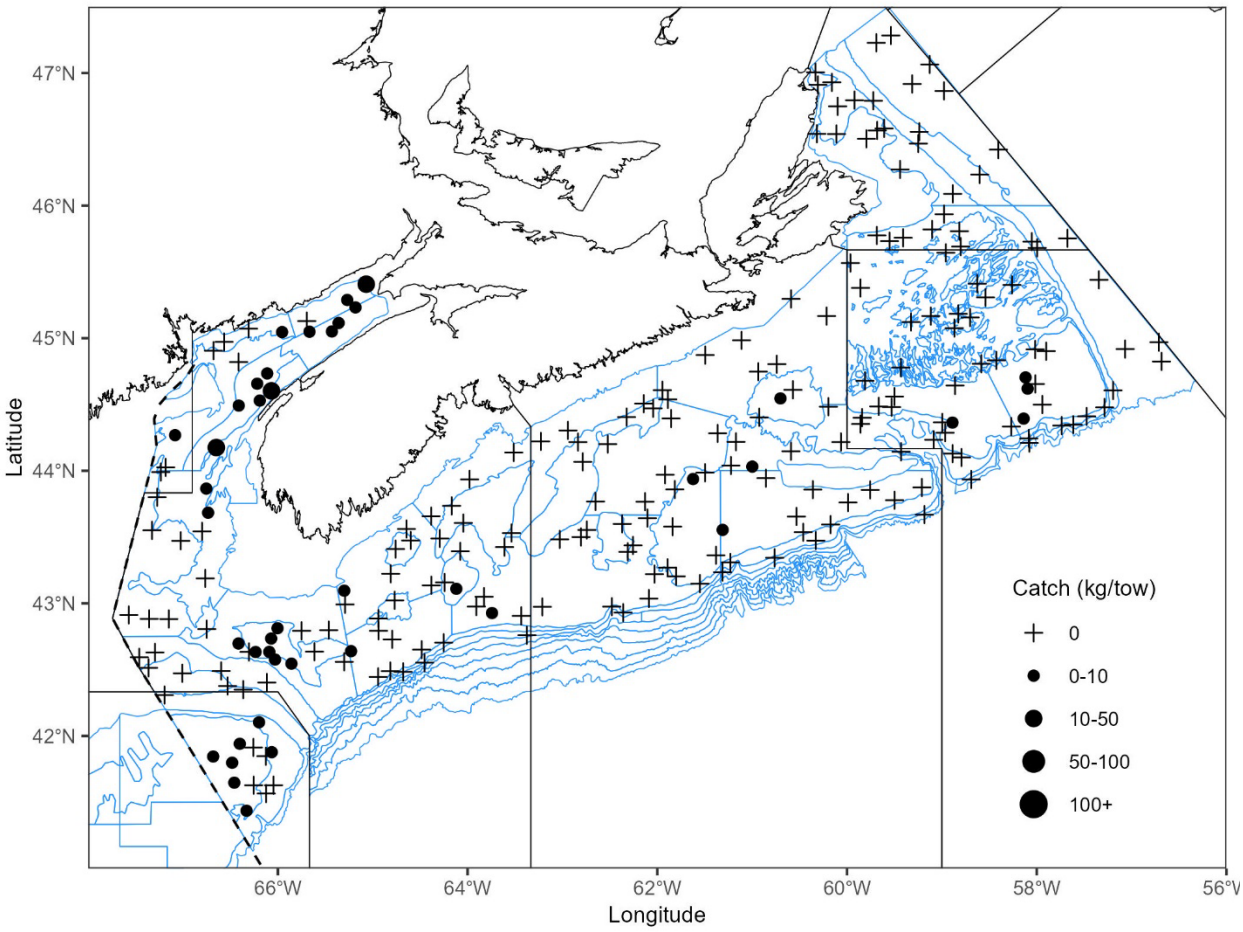

Figure 26a. Distribution of Sea Raven catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

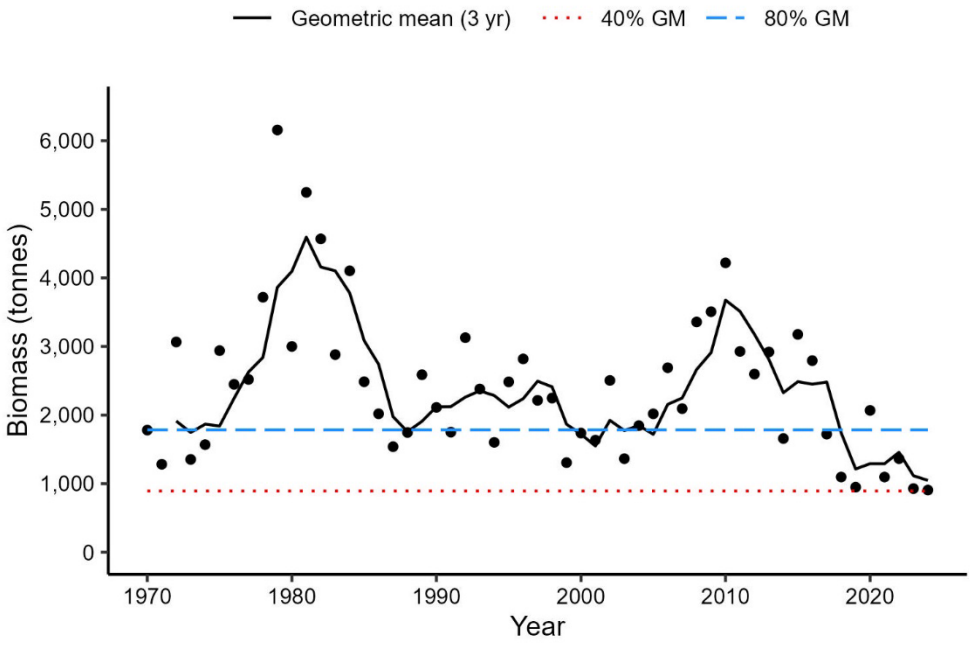

Figure 26b. Biomass index for Sea Raven in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

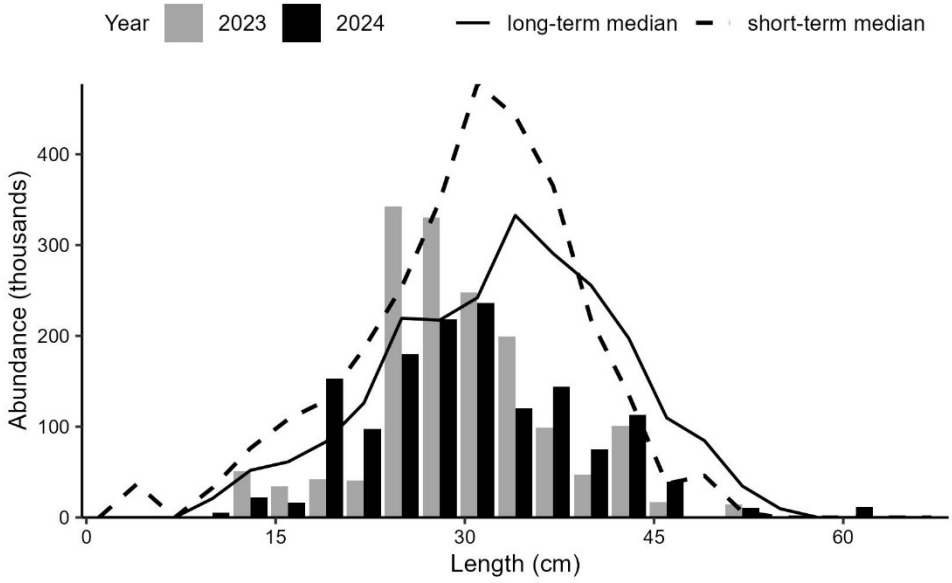

Figure 26c. Numbers-at-length (NAL) indices for Sea Raven in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

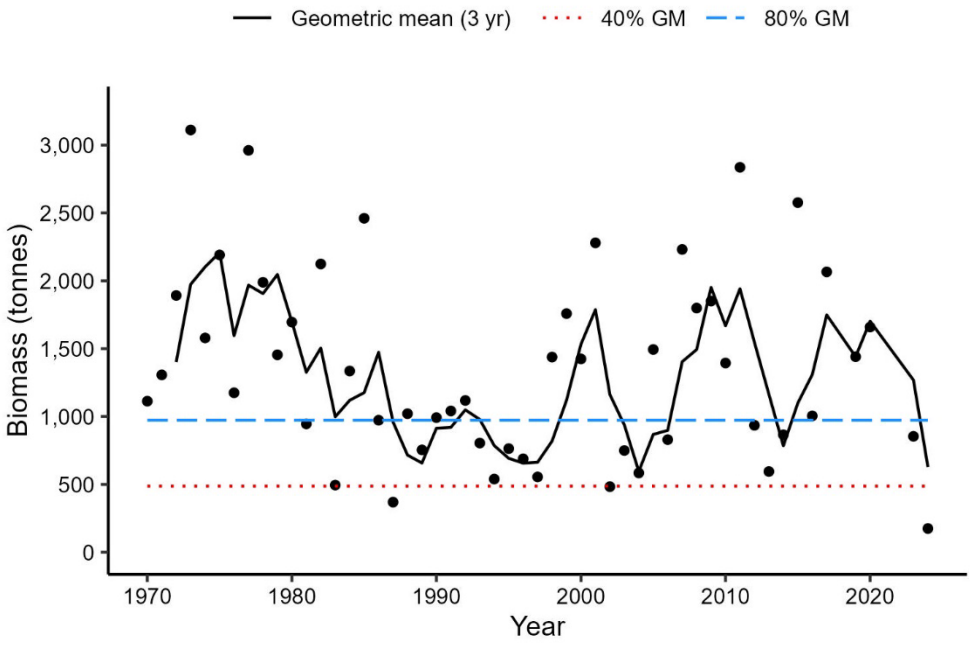

Figure 26d. Biomass index for Sea Raven in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

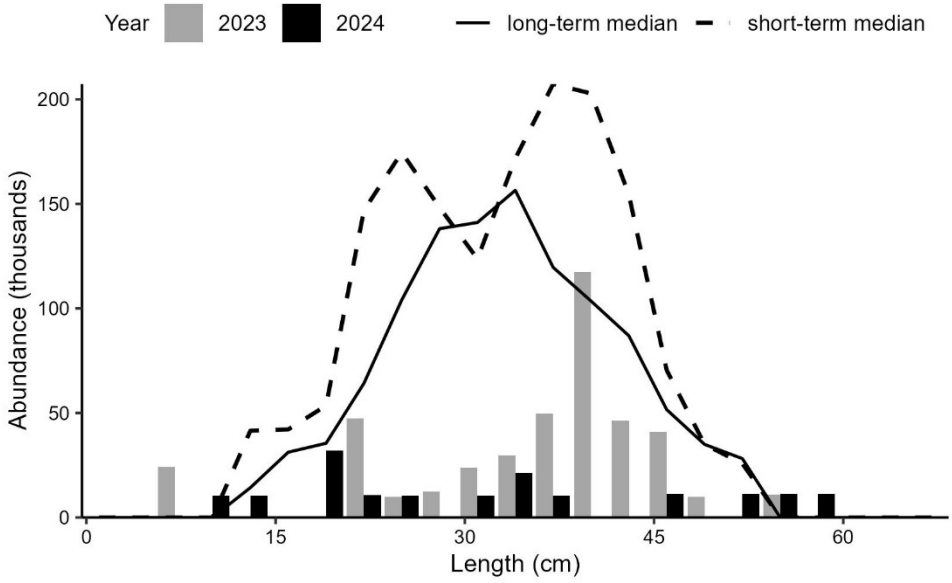

Figure 26e. Numbers-at-length (NAL) indices for Sea Raven in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Ocean Pout

Ocean Pout (*Zoarces americanus*) catches in 2024 were mostly distributed throughout 4X and the western half of 4W, with no catches in 4V (Figure 27a). The 2024 4X biomass index increased to above the 40% long-term GM for the first time since 2016, however, the 3-yr GM remains below this threshold for the seventh consecutive year (Figure 27b). NAL indices in 4X were generally above both the short-term and long-term medians for most lengths below 45 cm, however, indices for larger fish are much lower than the long-term median (Figure 27c). In 4VW, the 3-yr GM remains below the 40% long-term GM and has not exceeded this threshold since 2011 (Figure 27d). NAL indices are similar to or above the short-term and long-term median values but only for lengths below 32 cm (Figure 27e).

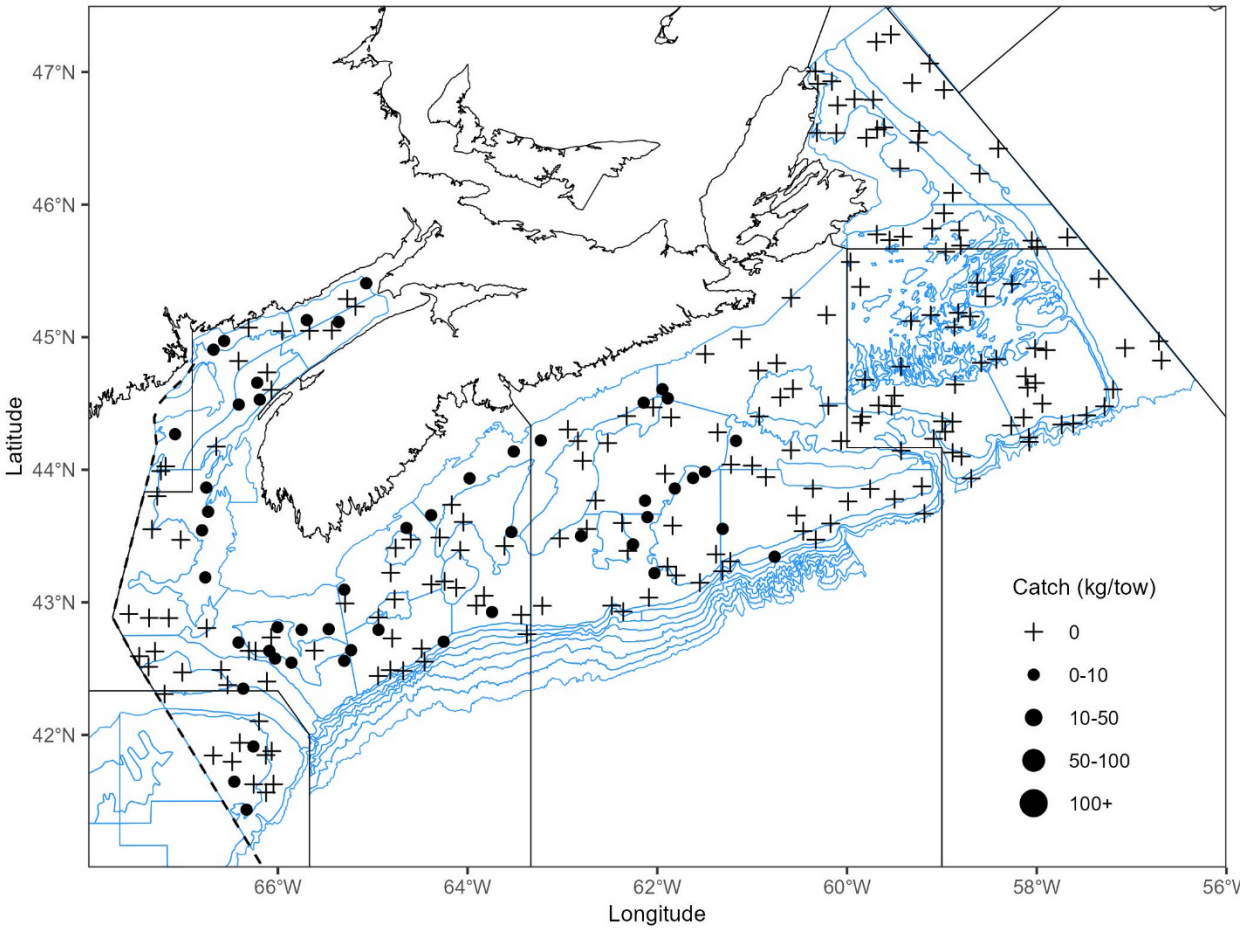

Figure 27a. Distribution of Ocean Pout catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

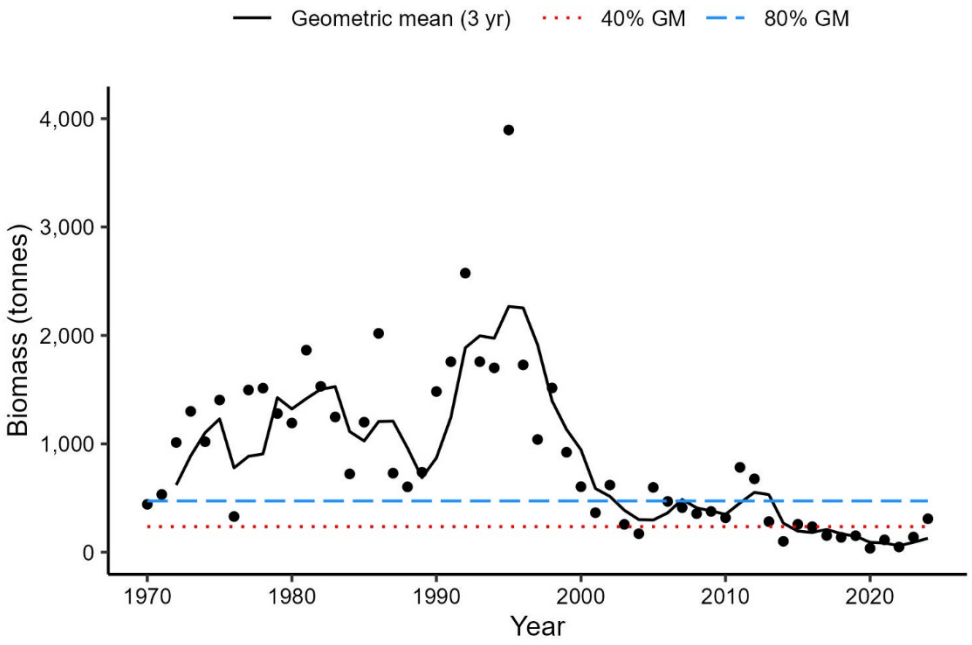

Figure 27b. Biomass index for Ocean Pout in 4X from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

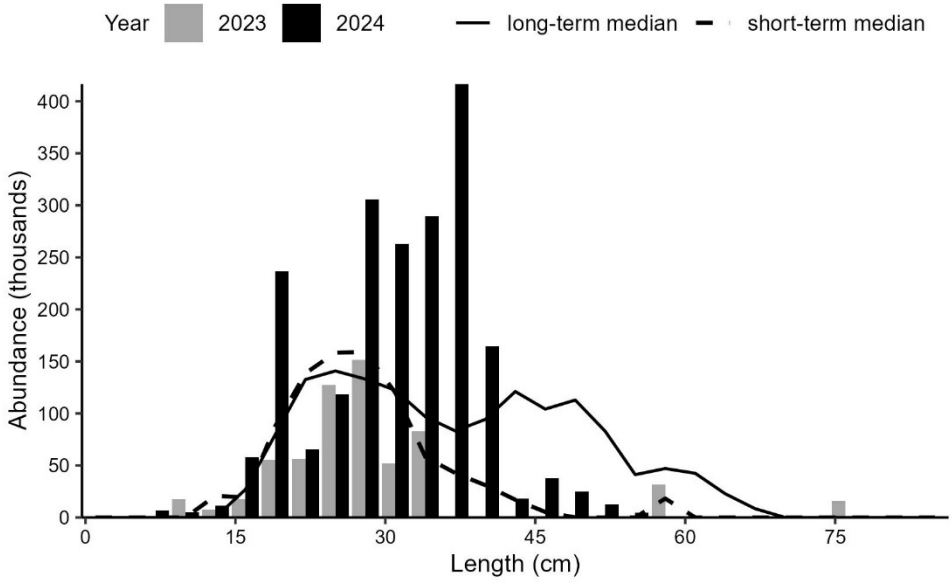

Figure 27c. Numbers-at-length (NAL) indices for Ocean Pout in 4X from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2022. The dashed black line represents the median NAL for the time period 2013–2022.

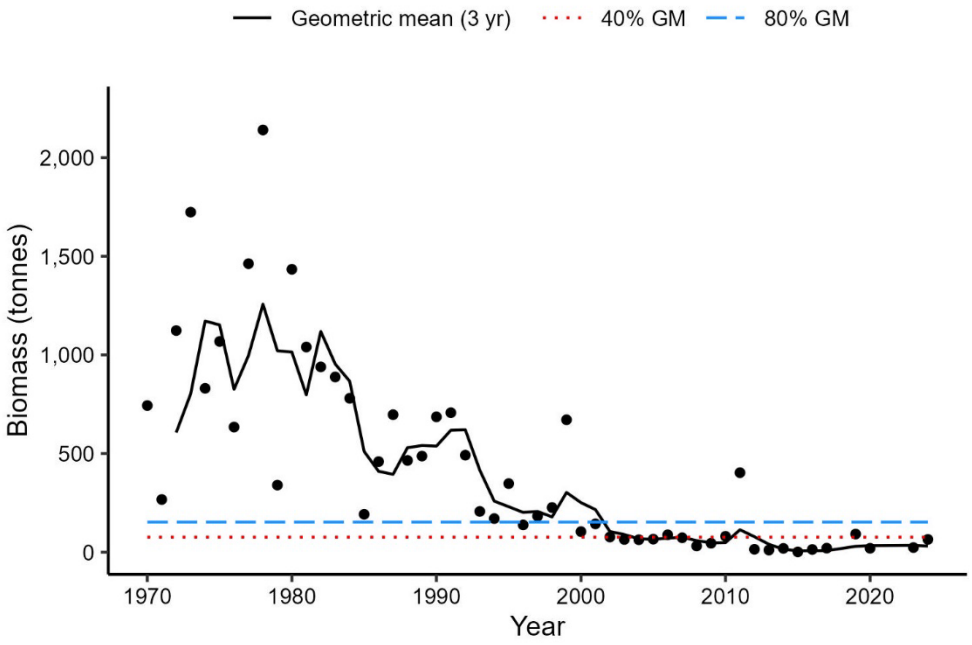

Figure 27d. Biomass index for Ocean Pout in 4VW from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

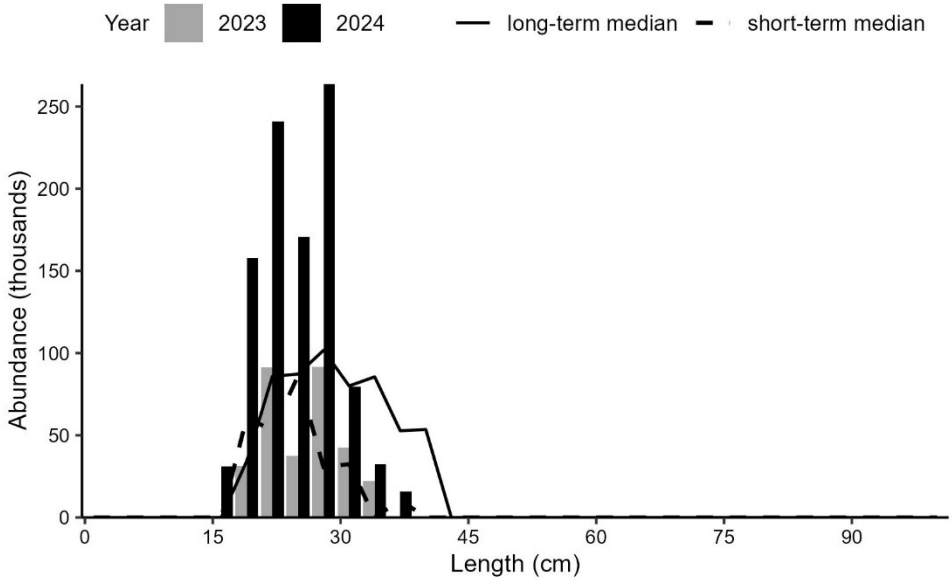

Figure 27e. Numbers-at-length (NAL) indices for Ocean Pout in 4VW from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

Blackbelly Rosefish

Blackbelly Rosefish (*Helicolenus dactylopterus*) were caught primarily in the deeper warmer waters along the edge of the Scotian Shelf and in the Fundian Channel in 2024 (Figure 28a). Blackbelly Rosefish have been caught in the survey in all years since 1980, but their biomass index in 4VWX has increased since 1990 and has varied at a higher level since about 2004. However, biomass has decreased substantially from the time series high in 2020, and in 2024 is the lowest index since 1998. The 3-yr GM index also decreased in 2024 but remains well above the 80% long-term GM (Figure 28b). The short-term median NAL is higher than the long-term median NAL; this reflects the overall increase in NAL in recent years, particularly for larger fish, which were rarely caught earlier in the series (Figure 28c). In 2023 there was a strong recruitment event in fish below 10 cm, however, 2024 NAL indices were below both the short-term and long-term medians and those fish from the recruitment event in 2023 were absent (Figure 28c).

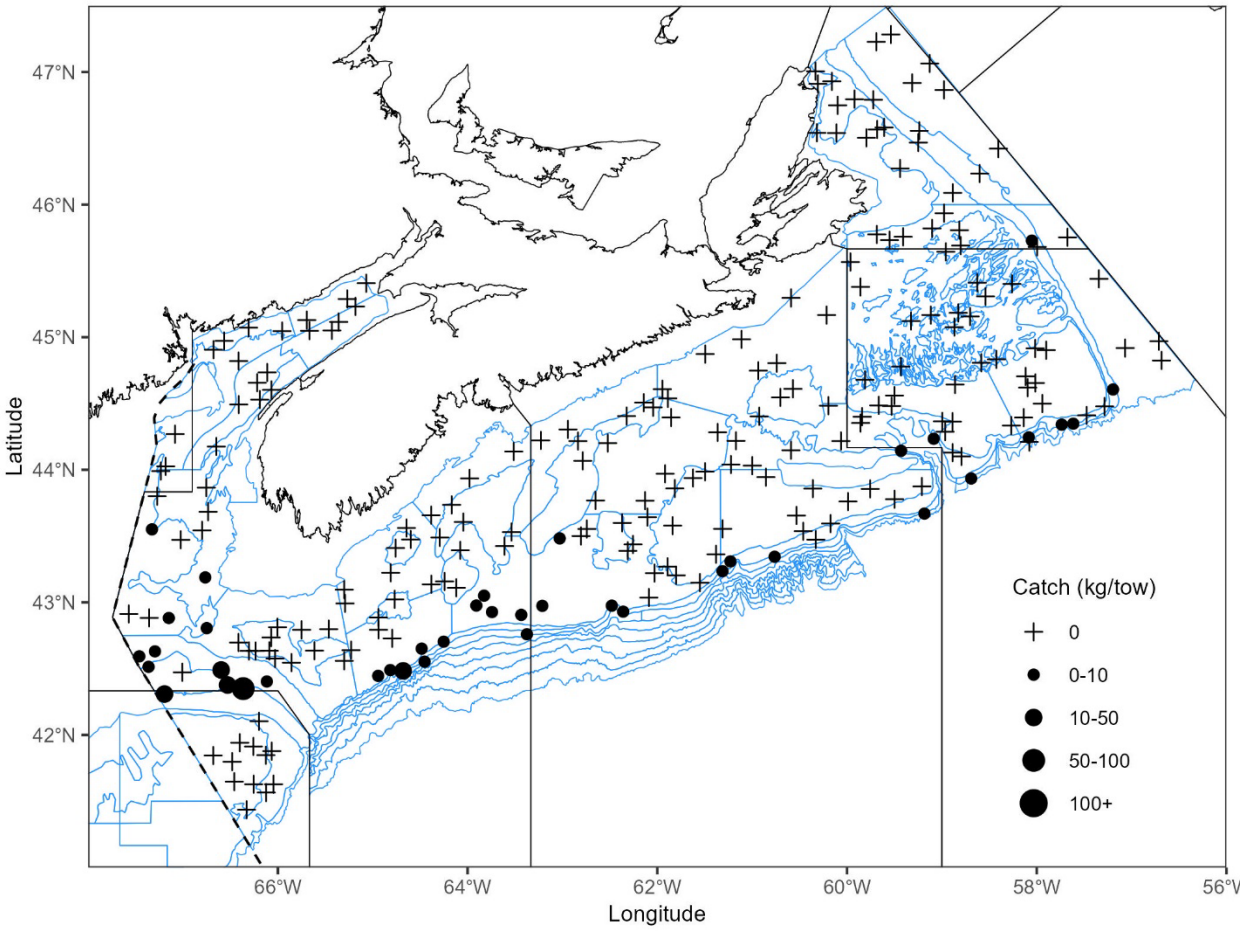

Figure 28a. Distribution of Blackbelly Rosefish catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

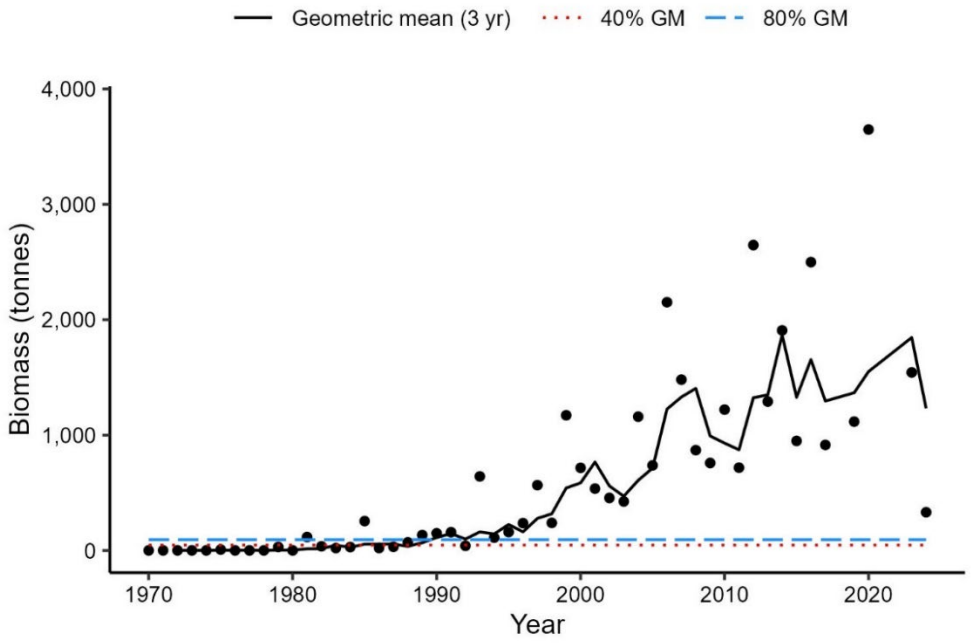

Figure 28b. Biomass index for Blackbelly Rosefish in 4VWX from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

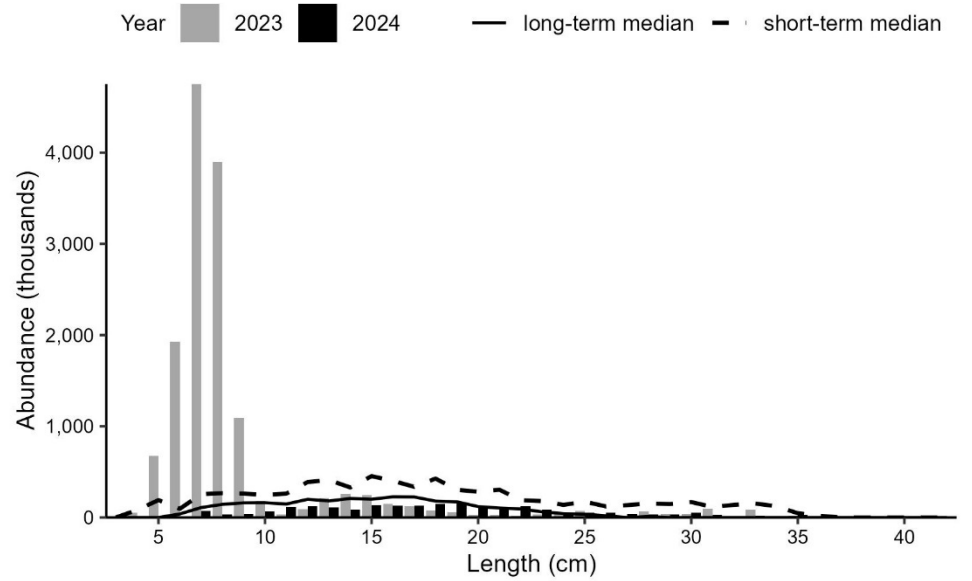

Figure 28c. Numbers-at-length (NAL) indices for Blackbelly Rosefish in 4VWX from the Summer Ecosystem RV Survey. Black bars represent the NAL from the 2024 survey. Grey bars represent the NAL from the 2023 survey. The solid black line represents the median NAL for the time period 1970–2020. The dashed black line represents the median NAL for the time period 2010–2020.

John Dory

John Dory (*Zenopsis conchifer*) are caught during the Summer Ecosystem RV Survey primarily in the deeper warmer waters along the edge of the Scotian Shelf and in the Scotian Gulf (South of Halifax), and occasionally in the Fundian Channel (Figure 29a). John Dory catches were rare for most of the time series, but since 2014, they have been caught every year, with the largest catch exceeding 150 kg in 2018. While their distribution remains restricted within the survey area, they can be locally abundant. John Dory caught in the survey have included adults in spawning condition and juveniles as small as 5 cm. In 2024, only a single John Dory was caught in 4X near the Scotian Shelf edge (Figure 29a). The 2024 biomass index decreased substantially from the time series high in 2023 (Figure 29b). The 2018 biomass index is not shown in Figure 29b due to incomplete survey coverage that year, although it is expected to have been even higher than the 2023 index given the largest catch in the time series of 150 kg. The largest individual throughout the entire time series was also caught in 2023 and measured 75 cm.

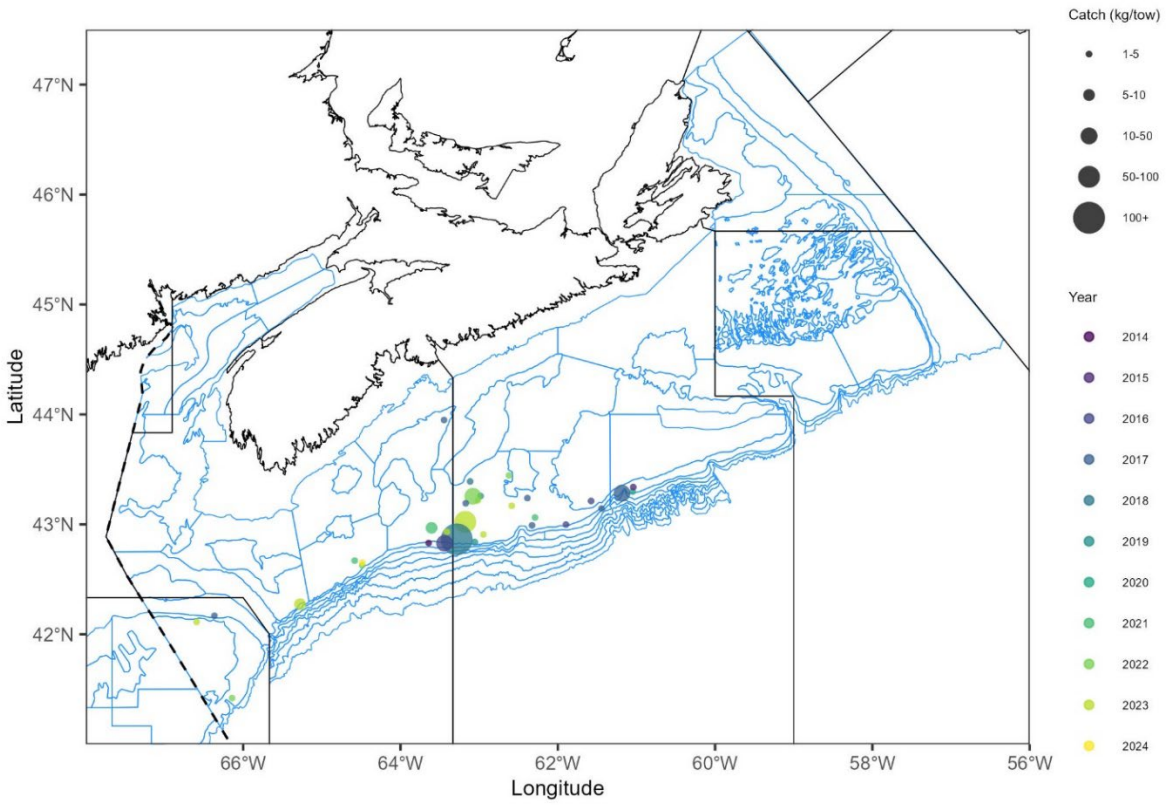

Figure 29a. Distribution of John Dory catches during the Summer Ecosystem RV Survey from 2014 - 2024. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

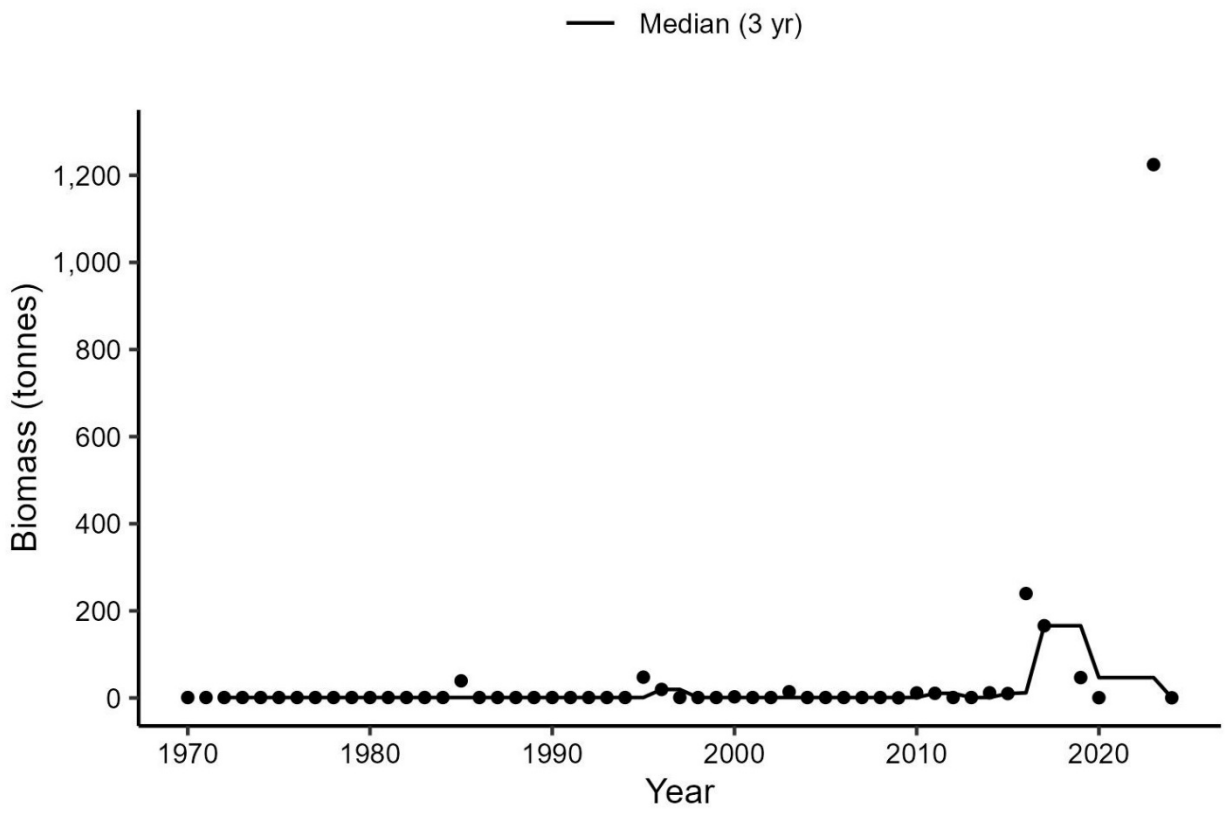

Figure 29b. Biomass index for John Dory in 4VWX from the Summer Ecosystem RV Survey. The three-year median biomass index is represented by the solid black line. The black dots represent the biomass index for that year.

Shortfin Squid

Shortfin Squid (*Illex illecebrosus*) are a short-lived, highly migratory species, with a broad distribution in the North Atlantic. In 2024, Shortfin Squid were caught throughout the 4VWX area except in the Bay of Fundy (Figure 30a). The 2024 biomass index for 4VWX Shortfin Squid remains below the 40% long-term GM for the second straight year after a period of relatively high biomass in comparison to the time series. The 3-yr GM remains slightly above the 40% long-term GM (Figure 30b).

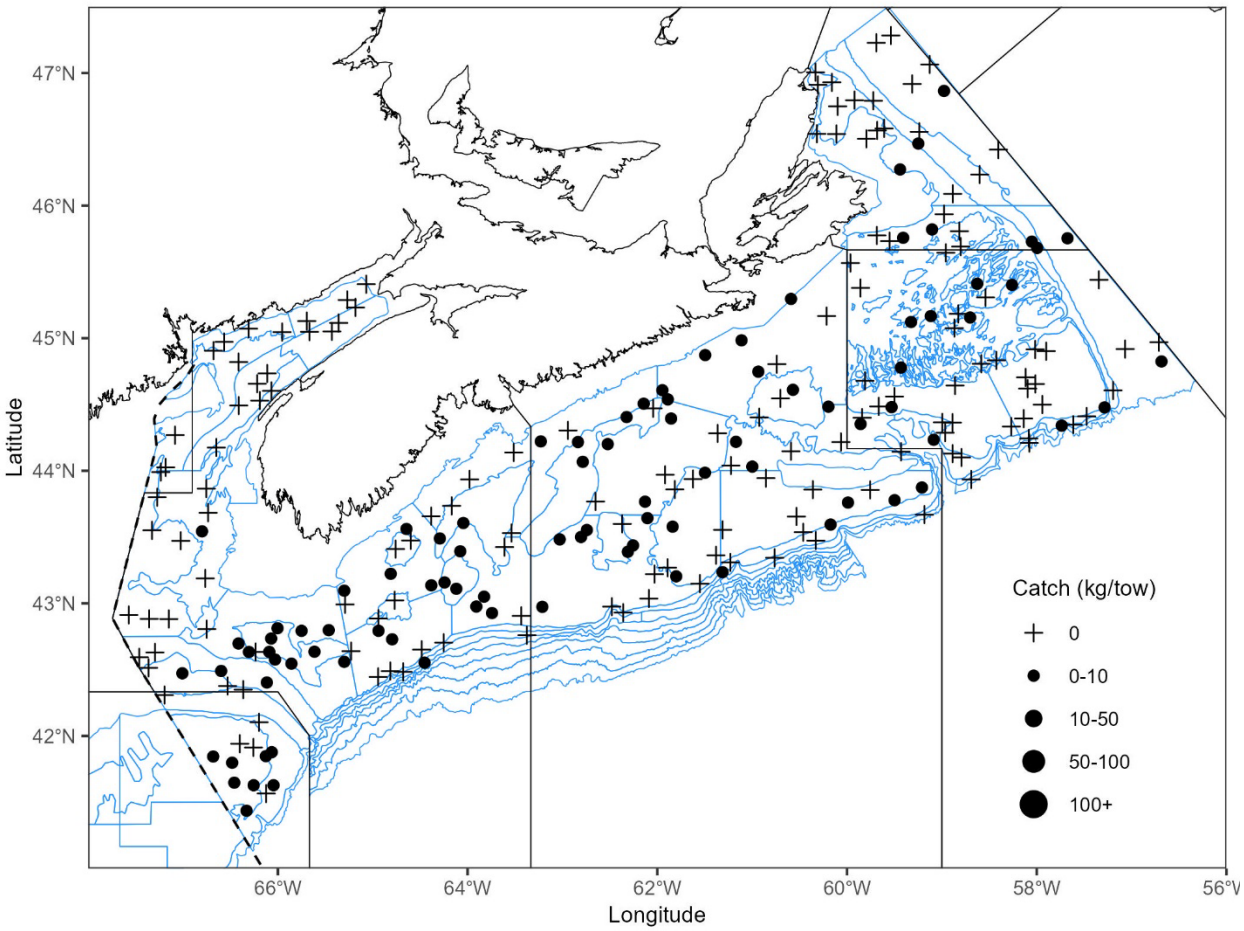

Figure 30a. Distribution of Shortfin Squid catches during the 2024 Summer Ecosystem RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size. Blue polygons represent survey strata boundaries.

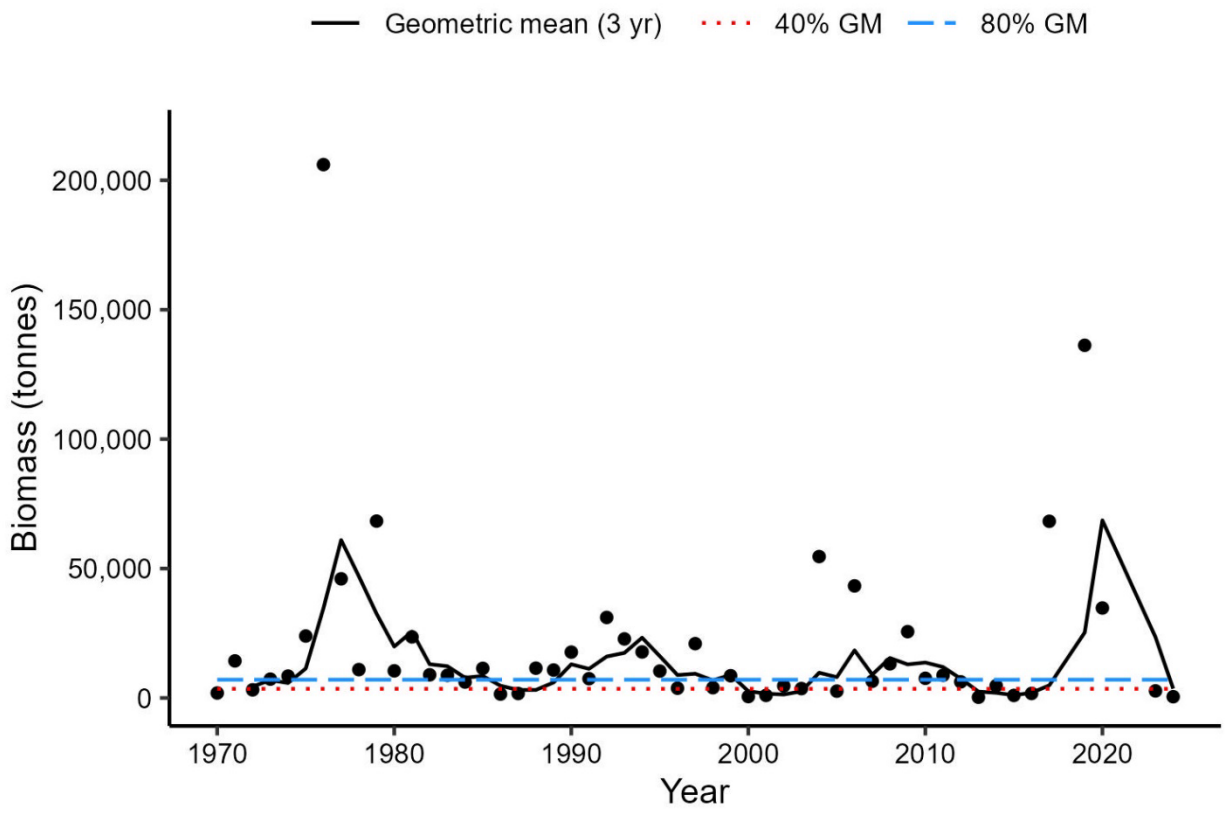

Figure 30b. Biomass index for Shortfin Squid in 4VWX from the Summer Ecosystem RV Survey. The three-year geometric mean biomass index is represented by the solid black line. The dashed blue and red lines represent 80% and 40% of the long-term geometric mean (1970–2023), respectively. The black dots represent the biomass index for that year.

Other Species

Dusky Shark (*Carcharhinus obscurus*) is a large pelagic shark and is considered accidental in Canadian waters. None have been captured in any Maritime Region survey, and these surveys are unlikely to provide useful information on distribution or abundance for this species.

Triggerfish (*Balistes capriscus*) are a demersal fish common off Florida and in other sub-tropical waters on both sides of the Atlantic. They are a demersal fish, which should be susceptible to capture by a bottom trawl; however, only one specimen has ever been caught in the Summer Ecosystem RV Survey time series. If these are being captured in commercial fisheries, it may be a seasonal migrant or may be found in depths not regularly sampled by the survey.

Tilefish *(Lopholatilus chamaeleonticeps*) are large, slow-growing fish found in deep, warm waters off the US coast from the Gulf of Mexico to Georges Bank. It is considered accidental in Canadian waters. Five specimens have been caught during the time series, ranging in size from 1.0 to 12.8 kg. This species is caught in both recreational and commercial fisheries off the US coast, generally with hook and line. The Summer Ecosystem RV Survey may not be suitable for providing useful information on distribution or abundance for this species.

Black Sea Bass (*Centropristis striata*) are a demersal species found from the Gulf of Mexico to Maine. This species has been caught during the Winter Ecosystem RV Survey on Georges Bank, but has not been recorded during the Summer Ecosystem RV Survey. It is considered accidental in Canadian waters.

CONCLUSIONS

In 2024, sampling was conducted in the majority of standard strata within 4VWX and the Canadian portion of 5Z. Of the 282 stations selected for sampling in 2024, 244 successful bottom trawl tows were completed in 36 fishing days. All strata within 4VWX5Zc received at least minimum coverage with the exception of stratum 497 (only one valid set) and strata 501–505 and 560, which received no coverage due to time limitations. Since the survey began in 1970, sampling has been completed in all strata from 440-495 with the exception of three years, 2018, 2021, and 2022. In addition to the bottom trawl sampling, a total of 239 conductivity temperature depth (CTD) casts, 51 vertical zooplankton tows and 26 eDNA samples were completed. A variety of special sampling was also completed including the collection of tissue samples from various species for genetic and stable isotope analyses, multi-species stomach collections for predator/prey and diet analyses, and monkfish tail weights for commercial landings conversion factors, among many others.

Several species more commonly associated with warmer waters south of the Scotian Shelf have been caught in the Summer Ecosystem RV Survey in recent years. Some, like Blackbelly Rosefish, are now well established on the Scotian Shelf. As water temperatures warm on the Scotian Shelf, it is expected that more southern species will appear in the survey and will become established in the region.

The total biomass index for demersal fish from the survey has been low in 4V since the 1990s. In 4W, total demersal fish biomass increased in the 1980s, then declined in the 1990s. Since 2019, yearly total biomass estimates for 4W have been the lowest in the time series as Haddock biomass has declined. The total biomass index for 4X shows high inter-annual variability with no clear trend over time; however, the 2024 total biomass index was among the lowest in the past two decades.

The NAL of large fish have been low for several species in recent years, and, for some species, the length range has been constricted. This constriction is apparent in the NAL figures, with the long-term median NAL extending to larger sizes or with much lower NAL at higher lengths in the most recent 10 years for species including Atlantic Cod, Haddock, Pollock, Witch Flounder, American Plaice, Yellowtail Flounder, Winter Flounder, Wolffish, Ocean Pout, and Thorny Skate.

The Western component Pollock stock has been highly variable since 2020, where it has exceeded the 80% long-term GM in 2021 and 2023, only to fall below the 40% long-term GM in 2022 and 2024. The Eastern component Pollock stock biomass remains low but rose above the 40% long-term GM in 2024. Halibut biomass in 4VWX remains at high levels, well above the 80% long-term GM.

Barndoor Skate biomass in 4X has been steadily increasing since the 1990s and the 2024 index remains high. Biomass in 4VW has also been increasing, to a lesser extent, and began a decade later in comparison to the increasing biomass in 4X.

The 2024 3-yr GM for 4X and 4Vn Atlantic Cod, 4VW Haddock, 4X and 4VW White Hake, Eastern Component Pollock, 4X Yellowtail Flounder, 4X and 4VW American Plaice, 4X and

4VW Thorny Skate, 4X and 4VW Wolffish, 4VW Winter Skate, and 4X and 4VW Ocean Pout are all below 40% of their respective long-term GM.

The 2024 3-yr GM for 4VsW Cod, Western Component Pollock, Unit III redfish, 4VW Yellowtail Flounder, 4X Witch Flounder, 4VW Winter Flounder, 4VW Monkfish, 4VW Longhorn Sculpin, 4VW Smooth Skate, 4X and 4VW Sea Raven, and 4VWX Shortfin Squid are all between 40% and 80% of their respective long-term GMs.

The 2024 3-yr GM for 4X Haddock, 4X West (Bay of Fundy) and 4VWX East Silver Hake, 4VWefghj redfish, 4VWX Halibut, 4X Winter Flounder, 4VW Witch Flounder, 4X and 4VW Red Hake, 4X and 4VW Little Skate, 4X Smooth Skate, 4X Winter Skate, 4X Monkfish, 4VWX Rosefish, 4VWX Spiny Dogfish, and 4X Longhorn Sculpin are all above 80% of their respective long-term GMs.

Biomass indices for large White Hake above 41 cm in 4X and 4VW in 2024 remain below the biomass recovery targets (DFO 2016).

Changes in biomass indices from one year to the next for individual species should be interpreted cautiously. A 3-yr GM of the survey biomass indices reduces the annual variability in biomass estimates and may better reflect actual biomass trends. For those species where a population model is used, the inter-annual variability in population biomass estimates is lower than the variability in survey estimates. Additional information from other surveys, commercial landings, and age composition, where available, can help in the interpretation of the RV survey data.

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THIS REPORT IS AVAILABLE FROM THE:

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ISSN 1919-3769
ISBN 978-0-660-76897-7 Cat. No. Fs70-7/2025-017E-PDF

Correct Citation for this Publication:

DFO. 2025. Maritimes Summer Ecosystem Research Vessel Survey Trends on the Scotian Shelf and Bay of Fundy for 2024. DFO Can. Sci. Advis. Sec. Sci. Resp. 2025/017.

Aussi disponible en français :

MPO. 2025. Tendances tirées des relevés d'été par navire de recherche sur l'écosystème réalisés par la région des Maritimes sur le plateau néo-écossais et dans la baie de Fundy pour 2024. Secr. can. des avis sci. du MPO. Rép. des sci. 2025/017.